



THE KENNEL CLUB
DOG HEALTH

Breed Health and Conservation Plan



Dobermann
2018

INTRODUCTION

The Kennel Club launched a dynamic new resource for breed clubs and individual breeders – the Breed Health and Conservation Plans (BHCP) project – in September 2016. The purpose of the project is to ensure that all health concerns for a breed are identified through evidence-based criteria, and that breeders are provided with useful information and resources to support them in making balanced breeding decisions that make health a priority.

The Breed Health and Conservation Plans take a holistic view of breed health with consideration to the following issues: known inherited conditions, complex conditions (i.e. those involving many genes and environmental effects such as nutrition or exercise levels, for example hip dysplasia), conformational concerns and population genetics.

Sources of evidence and data have been collated into an evidence base (Section 1 of the BHCP) which gives clear indications of the most significant health conditions in each breed, in terms of prevalence and impact. Once the evidence base document has been produced it is discussed with the relevant Breed Health Coordinator and breed health committee or representatives if applicable. Priorities are agreed and laid out in Section 2. A collaborative action plan for the health of the breed is then agreed and incorporated as Section 3 of the BHCP. This will be monitored and reviewed.

SECTION 1: EVIDENCE BASE

Demographics

The Dobermann is a Breed Watch category 1 breed, meaning that there are no current visible points of concern for judges to consider when at a judging appointment. The numbers of new registrations of the breed per year are shown in Table 1, and show a steady decrease until 2014 and a bumpy increase since then.

Table 1: Number of Dobermanns registered per year between 2007 and 2017

Year	Number of new Dobermann registrations	Percentage of breed out of total annual registrations
2007	2437	0.90%
2008	1871	0.69%
2009	1600	0.65%
2010	1678	0.65%
2011	1457	0.60%
2012	1346	0.59%
2013	1212	0.54%
2014	1104	0.50%
2015	1359	0.62%
2016	1288	0.57%
2017	1473	0.61%

The number of Dobermanns registered by year of birth between 1980 and 2017 are shown in Figure 1. The trend of registrations over year of birth (1980-2014) was -149.75 per year (with a 95% confidence interval of -212.02 to -87.49), reflecting the decrease in registrations. [Put simply, 95% confidence intervals (C.I.s) indicate that we are 95% confident that the true estimate of a parameter lies between the lower and upper number stated.]

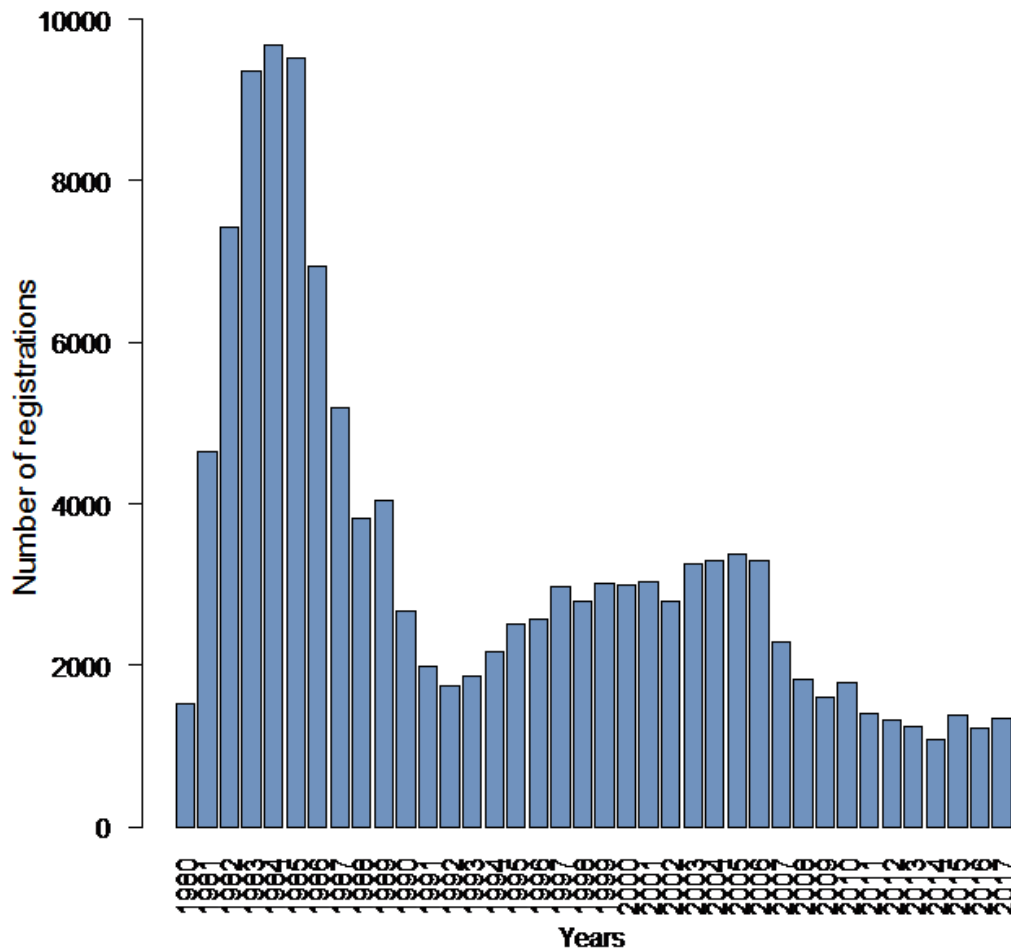


Figure 1: Number of registrations of Dobermanns per year of birth, 1980 – 2017

Literature review

The literature review lays out the current scientific knowledge relating to the health of the breed. We have attempted to refer primarily to research which has been published in peer-reviewed scientific journals. We have also attempted to acknowledge possible limitations of the studies reported, including when the research involved dogs in other countries. Whilst there are often strong links between populations of a breed in different countries, there are also often differences between the populations and issues seen in one country may not be seen (or may have a different prevalence) in another. However, it may also be useful for United Kingdom (UK) breeders to be aware of conditions occurring in the breed in other countries which have not yet been seen in the UK population, especially given that movement of breeding stock does occur between countries.

Behavioural conditions

Canine compulsive disorder: This condition, which phenotypically closely resembles obsessive-compulsive disorder (OCD) in humans, is considered to be particularly common in the Dobermann. The most common manifestations in the breed are blanket sucking and flank sucking, which are considered to be almost unique to the Dobermann (Moon-Fanelli et al, 1997). It appears to be a highly heritable, complex condition (Tang et al, 2014). No prevalence estimates could be found in the literature.

Cardiovascular conditions

Atrial fibrillation (AF): The Dobermann has been found to be at increased risk of this arrhythmia in two American case series. In a study of 109 cases of AF from two North American veterinary teaching hospitals, Dobermanns were over-represented in the group of cases where structural heart disease and overt congestive heart failure was present (Menaut et al, 2005). In a subsequent large study of 3,542 cases of AF in the Veterinary Medical Data Base in the USA, the Dobermann had an odds ratio of 5.66 compared to dogs of all breeds (Westling et al, 2008)

Atrial septal defect (ASD): This congenital heart defect involves a 'hole' in the wall separating the top two chambers of the heart, allowing oxygen-rich blood to leak into the oxygen-poor blood chambers in the heart. It has been described as having a relatively high incidence rate in the Dobermann in a Korean paper studying two affected littermates (Lee et al, 2007). No other references suggesting a possible breed predisposition, nor any prevalence estimates, could be found in the literature.

Dilated cardiomyopathy (DCM): The Dobermann has long been known to be predisposed to DCM. A full review of the literature relating to DCM in the breed is beyond the scope of this document; however, some key points and recent highlights are described here. DCM is a primary heart muscle disorder involving myocardial dysfunction, cardiac arrhythmias and congestive heart failure. A genetic evaluation in America suggested that the condition is familial in the Dobermann, and is inherited as an autosomal dominant trait (Meurs et al, 2007). The cumulative prevalence of the condition in continental Europe has been reported to be as high as 58.2% (Wess et al, 2010). It was reported that a 16 base pair deletion in the 5' splice site of intron 10 of the *pyruvate dehydrogenase kinase, isozyme 4 (PDK4)* gene was associated with development of DCM in American Dobermanns (Meurs et al, 2012), and a DNA test for this mutation was made available. However, it was subsequently found that this mutation was not associated with DCM in a larger European cohort of the breed (Owczarek-Lipska et al, 2012) and so use of the *PDK4* DNA test cannot be recommended. Whilst there is much research ongoing underway into the genetics of the condition in the Dobermann, phenotypic screening remains the mainstay of attempts to reduce the incidence of the condition. The European Society of Veterinary Cardiology has recently published screening guidelines; they recommend that annual screening for occult DCM in Dobermanns should start at three years of age, and use both Holter monitoring and echocardiography (Wess et al, 2017).

Patent ductus arteriosus (PDA): This congenital heart condition involves failure of a foetal blood vessel to close after birth, allowing abnormal blood flow between the aorta and the pulmonary artery. The breed appeared to be at increased risk of PDA, with nine cases and an odds ratio of 2.8 compared to dogs of other breeds, in comparison with the general hospital population in a retrospective study of the medical records of 976 dogs diagnosed with congenital heart disease at a cardiology clinic in Italy (Oliveira et al, 2011).

Dermatological conditions

Acral lick dermatitis (acral lick granuloma): This condition is characterised by firm, raised, ulcerated plaques preceded by erosion of the skin due to chronic or intense licking, and generally affects the distal forelimb. It is considered that some cases represent a 'psychophysiological disorder', a primary skin condition that can be affected by emotional stress, whilst others are primary behavioural disorders and the Dobermann appears to be predisposed (Virga, 2003). No prevalence estimates could be found in the literature.

Colour dilution alopecia: This hereditary skin disease has been described in blue, brown and fawn Dobermanns, and is considered to have an autosomal recessive mode of inheritance (Kim et al, 2005). No prevalence estimates could be found in the literature.

Follicular dysplasia: This condition causes alopecia due to abnormal functioning of hair follicles due to structural abnormalities. It has been reported to affect black or brown Dobermanns, with an age of onset of one to four years (Miller, 1990).

Generalised demodicosis (demodectic mange): Demodex are cutaneous mites that cause clinical disease when their numbers increase, for example due to underlying systemic disease or immunosuppression. It is considered that there may be a Demodex-specific hereditary immunodeficiency in some cases, particular in juvenile-onset forms (Bowden et al, 2018). A study of clinical cases of the condition in five districts in India reported that the Dobermann was overrepresented (23% of the 1697 cases) between 1987 and 1992 (Nayak et al, 1997). No other papers from other regions or countries could be found to support this apparent overrepresentation.

Endocrine conditions

Hypothyroidism: Primary hypothyroidism is a common endocrinopathy in dogs, and is often caused by lymphocytic thyroiditis. Lymphocytic thyroiditis has a genetic component and several breeds including the Dobermann are considered particularly susceptible to the disease, although no prevalence estimates could be found in the literature. A study of 27 affected and 129 unaffected Dobermanns in America looked at three dog-leucocyte antigen (DLA) genes, DLA-DRB1, DQA1 and DQB1, and found a rare haplotype at increased frequency in the affected dogs compared to the unaffected dogs (Kennedy et al, 2006).

Gastrointestinal conditions

Gastric dilatation-volvulus syndrome (GDV, bloat): GDV is an acute, life-threatening condition featuring rapid accumulation of air in the stomach, malposition of the stomach to a varying degree and a rise in intragastric pressure, frequently leading to the development of cardiogenic shock (Glickman et al, 2000). In a VetCompass study of 77,088 dogs attending 50 Vets Now practices in the UK between 1st September 2012 and 28th February 2014, the Dobermann had a breed-specific prevalence of 2.9% (95% C.I. 1.5-5.0%; 12 cases in 417 dogs of the breed) compared to an all-breed prevalence of 0.64% (95% C.I. 0.5-0.70). The Dobermann had an odds ratio for GDV of 26.4 (95% C.I. 11.8-59.2) compared with dogs of no recognisable breed (O'Neill et al, 2017a).

Haematological conditions

Von Willebrand's disease (vWD): vWD is the most common heritable canine bleeding disorder. There are three types; type I vWD is characterised by a low concentration of structurally normal vW factor (vWf) and relatively mild clinical signs, with the Dobermann having the highest reported breed prevalence of type 1 vWD (Brooks, 1999). The mutation causing type 1 vWD was characterised in 1998 as a G to A transversion of the last nucleotide of vWf exon 43 (c.7437G>A, NM_001002932.1); this has an autosomal recessive mode of inheritance, and a DNA test for the mutation is available (Brewer, 2004).

Hepatic conditions

Chronic hepatitis: This condition was first recognised in Dobermanns in the early eighties, predominantly affecting female dogs aged between four and seven years of age, and has been suggested to be a form of copper toxicosis (Mandigers, 2004). More recently it has been suggested that the condition has an autoimmune background, based on findings including female predisposition and homozygosity for DLA-DRB1*00601 (Dyggve et al, 2017). The presence of particular autoantibodies and autoantigens has been proposed as potential screening targets. No prevalence estimates could be found in the literature.

Immunological conditions

No scientific references to conditions in this category could be found for the breed, however some of the conditions listed in other categories are considered to have an autoimmune aetiology.

Musculoskeletal conditions

Carpal laxity syndrome: The Dobermann has been described as predisposed to this condition of the forelegs in puppies, which is usually self-limiting (Cetinkaya, Yardimki & Saglam, 2007). No prevalence estimates for the condition in the breed could be found in the literature.

Panosteitis: The Dobermann was reported to be at elevated risk of panosteitis, with a breed-associated odds ratio compared to mixed breeds of 1.9 (95% C.I. 1.6-2.2), based on dogs which had attended veterinary teaching hospitals in the USA; this result was based on 224 cases and 817 non-cases in the breed (LaFond et al, 2002).

Neoplastic conditions

Cutaneous neoplasia: The Dobermann had the third highest prevalence of cutaneous (skin) neoplasia in a retrospective study of 104 histopathological samples examined at a Bulgarian university clinical pathology department between 1991 and 2000 (Dinev, 2002).

Lipoma: The breed has been described as being at increased risk of lipoma, including possibly the more severe, infiltrative form (Gough, Thomas and O'Neill, 2018); however, no primary references or prevalence estimates could be found.

Lymphoma: The Dobermann was reported to be at increased risk of lymphoma compared to crossbreeds, with an odd ratio of 7.64 (95% C.I. 2.87-20.34), based on dogs seen at the University Teaching Hospital, University of Sydney between 2001 and 2009 (Yau et al, 2017).

Mammary tumours: Analysis of Swedish Agria insurance data, considering female dogs enrolled for both veterinary care and life insurance during 1995 to 2006, estimated the disease incidence of pyometra in 260,000 female dogs. Each full year a dog was insured contributed to one dog-year at risk (DYAR). The overall incidence rate for mammary tumours was 112 cases per 10,000 DYAR (95% C.I. 110-114). The proportion of bitches of all breeds that developed mammary tumours by 10 years of age was 13%; using Cox's proportional hazards regression without independent variables, the proportion of Dobermann bitches in this study that developed mammary tumours by 10 years of age was 42.0% (absolute numbers were 135 cases in 1,744 bitches), ranking the breed second out of 110 breeds in terms of breed-specific proportion (Jitpean et al, 2012).

Melanoma: The breed was found to be at increased risk of cutaneous melanoma in a retrospective study of Veterinary Medical Data Base data 1964-2002, with an odds ratio of 3.02 (95% C.I. 2.32-3.93; 60 cases and 32,015 non-cases) compared to all other breeds (Villamil et al, 2011).

Osteosarcoma: The Dobermann was found to be at increased risk of this malignant bone tumour in a retrospective study of Veterinary Medical Data Base data 1980-1994, with an odds ratio of 2.3 (95% C.I. 1.8-3.0; 542 cases and 176 non-cases) compared to the German Shepherd Dog (Ru et al, 1998). The breed was also found to be at high risk of malignant bone tumours in a study of Swedish Agria insurance data, with an overall incidence of 24 cases (95% C.I. 13-35) per 10,000 DYAR compared to the rate in all breeds combined of 5.5 cases per 10,000 DYAR (Egenvall et al, 2007).

Synovial myxoma: The breed has been reported to be at increased risk of this joint tumour, with four of six cases occurring in Dobermanns or their crosses in a study of synovial tumours seen at the Veterinary Hospital of the University of Pennsylvania and two other American referral hospitals between 1993 and 2000 (Craig et al, 2002).

Neurological conditions

Cervical spondylomyelopathy (cervical vertebral malformation, Wobbler syndrome): This disorder is characterised by compression of the cervical spinal cord and/or nerve roots. It can be osseous-associated or disc-associated (although overlap exists), and the disc-associated form is particularly common in middle-aged or older Dobermanns (Bonelli et al, 2017). It has been postulated that there may be a genetic component to the condition, and a condition being more common in one breed than others is often evidence of this, but as yet this has not been definitely established.

Congenital deafness and vestibular dysfunction ('vestibular deafness', 'DINGS'): This condition, characterised by early onset vestibular deficits and hearing loss, was first described in 1992 (Wilkes and Palmer, 1992). Severe deafness, confirmed by brainstem auditory evoked response (BAER) testing, was present by three weeks of age in all affected puppies and they also showed behavioural signs of head tilt, circling and ataxia due to vestibular disease. Pedigree analysis suggested an autosomal recessive mode of inheritance. Recently, whole genome sequencing of an affected 12 week old Dobermann puppy was undertaken at the North Carolina State University and a mutation in the *PTPRQ* gene which is known to be associated with both deafness and disease of the vestibular system in humans was found (Guevar et al, 2018). DNA samples from 202 unaffected Dobermanns were then tested; 196 dogs were homozygous wild type (clear) and six dogs were heterozygous for the mutation, giving an allele frequency of 1.5% in the sample population. The authors noted that the affected dog in this most recent study was only unilaterally deaf, unlike the Wilkes and Palmer cases, and suggest that further genetic evaluation of affected dogs should be undertaken before a genetic test can be developed.

Dancing Dobermann disease: This distal sensorimotor polyneuropathy has only ever been seen in Dobermanns, and was first described in America in 1990 (Coates and O'Brien, 2004). Clinical signs begin at between six months and seven years of age, and the gastrocnemius muscle is most severely affected, and an effective treatment has not been found. It has been reported that 19 affected dogs' pedigrees were traced back to an American sire in the 1940s, and considered likely to be an autosomal recessive traits (Coates and O'Brien, 2004).

Discospondylitis: Infection of the cartilaginous vertebral endplates of the spine with secondary involvement of the intervertebral disc is termed discospondylitis. A study of 513 dogs with the condition from 12 veterinary teaching hospitals in the USA, and 236,109 dogs without the condition (controls), reported that the Dobermann was at increased risk of discospondylitis, with an odds ratio of 2.3 (95% C.I. 1.3-4.0; 14 cases, 1,763 controls) compared to mixed-breed dogs (Burkert et al, 2005). Only four of the 513 cases of the condition in any breed were associated with previous vertebral column surgery.

Episodic head tremor. This condition has been described as an inherited, idiopathic, paroxysmal movement disorder affecting dogs of the breed (Wolf et al, 2011). Eighty seven affected Dobermanns were studied in Germany, and pedigree analysis of 60 affected dogs revealed a common male ancestor who lived in the 1960s. Eleven affected dogs from three litters had all had their first episode before one year of age, and the authors suggested that those individuals were affected by an early onset familial form of the condition. The authors stated that episodic head tremor has a high prevalence in the Dobermann, but no prevalence estimate was provided nor could one be found elsewhere.

Intervertebral disc disease (IVDD): The Dobermann was found to be at increased risk of IVDD in a review of Swedish Agria insurance data, with 88.6 occurrences per 10,000 DYAR (third highest) compared to 27.8 occurrences per 10,000 for the all-breed population (Bergknut et al, 2012). These figures included cases of cervical spondylomyopathy. A subsequent study of electronic patient records of 90,004 dogs examined at the University of California-Davis Veterinary Medical Teaching Hospital, USA, between 1st January 1995 to 1st January 2010, found the Dobermann to be the fifth most frequently affected breed with IVDD, with a breed-specific prevalence of 12.70% compared to a mixed breed-prevalence of 4.43% (Bellumori et al, 2013). Those authors did not specify if case of cervical spondylomyopathy were included in their figures.

Narcolepsy. This sleep disorder was first described, with a suggested autosomal recessive mode of inheritance, in the breed nearly 40 years ago (Foutz et al, 1979). A colony of narcoleptic dogs was developed at Stanford University in America and has been studied extensively. The causal mutation, in the hypocretin (orexin) receptor 2 gene (*Hctr2*) was identified in 1999, and a DNA test is available (Lin et al, 1999).

Ocular conditions

Multiple ocular defects: This congenital condition involving total blindness has been described in Scandinavia, the USA and the UK, and is suspected to be an autosomal recessive hereditary trait (Bergsjø et al, 1984; Lewis et al, 1986). Features of the condition include microphthalmia, anterior segment dysgenesis, congenital cataract and retinal dysplasia.

Persistent hyperplastic primary vitreous (PHPV): The Dobermann has long been known to be affected by this congenital, hereditary eye condition (Boevé et al, 1998).

Other ocular conditions: The American College of Veterinary Ophthalmologists (ACVO) consider the Dobermann to be predisposed to microphthalmia with multiple ocular defects, distichiasis, persistent pupillary membranes (PPM), cataract, PHPV, retinal dysplasia and ligneous conjunctivitis (Genetics Committee of the ACVO, 2015). In 2015, 186 dogs of the breed were examined by the ACVO and prevalence data are shown in Table 2 alongside data from previous years. Overall, 83.9% (156 of 186) of dogs of the breed examined in 2015 had healthy eyes unaffected by any disease conditions. However, it is important to give consideration to the fact that these data relate to the American population of the breed.

Table 2: ACVO examination results for the Dobermann, 2000 - 2015

Disease Category/Name	Percentage of Dogs Affected		
	2000-2009 (n=2144)	2010-2014 (n=991)	2015 (n=186)
Eyelids			
Distichiasis	1.7%	1.5%	1.1%
Uvea			
Persistent pupillary membranes	2.8%	8.3%	16.7%
Lens			
Cataract, significance unknown	7.6%	4.4%	9.7%
Vitreous			
PHPV	0.8%	1.5%	1.1%
Retina			
Retinal dysplasia (folds)	2.6%	0.7%	2.7%

Reproductive conditions

Prostate disease: The Dobermann was reported to be the breed at greatest risk of developing prostate disease, based on a study of all cases diagnosed at the College of Veterinary Medicine at the University of Illinois, USA (Krawiec and Heflin, 1992). All types of disease of the prostate were included; bacterial prostatitis was most common, followed by prostatic cyst, prostatic adenocarcinoma and benign hyperplasia. Some 177 cases were diagnosed, and 9% of the cases (16 dogs) were Dobermanns. This gave a statistically higher prevalence of prostatic disease than would be expected from the total number of Dobermanns (314, 4.4% of the overall total) seen at the hospital over this time period. However, no prevalence estimates were provided and no more recent reports were found in the literature.

Pyometra: Analysis of Swedish Agria insurance data, considering female dogs enrolled for both veterinary care and life insurance during 1995 to 2006, estimated the disease incidence of pyometra in 260,000 female dogs. The overall incidence rate for pyometra was 199 cases per 10,000 DYAR (95% C.I. 196-202). The prevalence of pyometra in Dobermann bitches in this study was 43.0% (152 cases in 1,744 bitches), ranking the breed 17th out of 110 breeds in terms of breed-specific prevalence (Jitpean et al, 2012).

Respiratory conditions

No scientific references to conditions in this category could be found for the breed.

Urological conditions

Familial renal disease: Hereditary, progressive renal disease, histologically defined as membranoproliferative glomerulonephritis, was first described in 13 Dobermanns in Ontario, Canada nearly 40 years ago (Wilcock and Patterson, 1979). All affected dogs were traced to a common male ancestor no more than four generations previously. There was no sex predisposition, and clinical signs often began before one year of age. Cases have subsequently been reported in America (Picut and Lewis, 1987) but the mode of inheritance has not been established and no prevalence estimates could be found in the literature.

Urinary incontinence: The Dobermann was reported to be a breed at increased risk of urinary incontinence due to urethral sphincter mechanism incompetence in bitches, in a study of confirmed referral cases at the University of Bristol (Holt and Thrusfield, 1993). More recently, a VetCompass study of 100,397 bitches attending 119 veterinary clinics between 1st September 2009 and 7th July 2013 reported that the Dobermann had a prevalence of 21.6% (95% C.I.17.4-26.6) for the condition, compared to an all-breed prevalence of 3.14% (95% C.I. 2.97-3.33). The Dobermann had an odds ratio for urinary incontinence of 5.35 (95% C.I. 3.01-9.51; 13 cases and 297 non-cases) compared with dogs of no recognisable breed (O'Neill et al, 2017b).

Urolithiasis – calcium oxalate: The breed was found to be at increased risk of calcium oxalate uroliths in a Canadian case series of urolith submissions between 1998 and 2001, with an odds ratio of 5.60 (95% C.I. 1.83-17.18; 18 cases) compared to crossbreeds (Ling et al, 2003).

Purebred/pedigree dog health survey results

2004 Morbidity results: Health information was collected for 129 live Dobermanns of which 70 (54%) were healthy and 59 (46%) had at least one reported health condition. The top categories of diagnosis were musculoskeletal (17.4%, 19 of 109 reported conditions), haematopoietic (11.9%, 13 of 109 reported conditions), reproductive (11.0%, 12 of 109 reported conditions) and dermatologic (7.3%, 8 of 109 reported conditions). The most frequently reported specific conditions were Von Willebrand's disease (8.5% prevalence, 11 cases), false pregnancy (5.6%, 5 cases in the 89 female Dobermanns in the dataset), hypothyroidism (4.7% prevalence, 6 cases), alopecia (4.7% prevalence, 6 cases) and lipoma (3.9% prevalence, 5 cases).

2004 Mortality results: A total of 100 deaths were reported for the breed. The median age at death for Dobermanns was 10 years and 6 months (min = 1 year and 1 month, max = 16 years and 6 months). The most frequently reported causes of death by organ system or category were cancer (26.0%, 26 of 100 deaths), old age (22.0%, 22 deaths), cardiac (15.0%, 15 deaths) and neurologic (10.0%, 10 deaths). The most frequently reported specific causes of death were cancer (26.0%, 26 deaths), old age (22.0%, 22 deaths), dilated cardiomyopathy or cardiomyopathy unspecified (8.0%, 8 deaths) and wobbler (5.0%, 5 deaths).

2014 Morbidity results: Health information was collected for 333 live Dobermanns of which 190 (57.1%) had no reported conditions and 145 (43.5%) were reported affected by at least one condition. The most frequently reported specific conditions were lipoma (11.4% prevalence, 38 cases), DCM (4.2%, 14 cases), urinary incontinence (4.2%, 14 cases) and hypothyroidism (3.9%, 13 cases). Further analysis of the morbidity results suggested that the Dobermann was at increased risk of alopecia/baldness, DCM, Demodex infestation, heart failure, hypothyroidism, lipoma, skin lump, unspecified respiratory conditions and urinary incontinence compared to the average risk for dogs of all breeds (Wiles et al, 2017).

2014 Mortality results: A total of 100 deaths were reported for the breed. The median age at death for Dobermanns was 8 years (min = 1 year, max = 18 years). The most frequently reported causes of death were DCM (19.0%, 19 deaths), cancer unspecified (11.0%, 11 deaths) and heart failure (9.0%, 9 deaths).

VetCompass results

Whilst a breed-specific VetCompass study has not yet been completed, some condition-specific studies have yielded findings relevant to the Dobermann. These results are summarised under the respective conditions above.

Insurance data

UK Agria data

Insurance data were available for Dobermanns insured with Agria UK. 'Exposures' are equivalent to one full policy year; in 2016 there were 981 free exposures, 265 full exposures and 453 claims, in 2017 these figures were 1,208, 291 and 397 respectively. Full policies are available to dogs of any age. Free policies are available to breeders of Kennel Club registered puppies and cover starts from the time the puppy is collected by the new owner; cover under free policies lasts for five weeks from this time. It is possible that one dog could have more than one settlement for a condition within the 12-month period shown. The top 10 conditions by number of settlements, for authorised claims where treatments started between 1st October 2016 and 31st September 2017, are shown in Table 3 below.

Table 3: Top 10 conditions and number of settlements for each condition between 1st October 2016 and 31st September 2017 for Dobermanns insured with Agria UK

Condition	Number of settlements
Hypothyroidism	25
Osteoarthritis (degenerative joint disease)	25
Incontinence	24
Skin tumour	15
Cut to skin	13
Foreign body – stomach or intestine	13
Lameness	12
Cardiomyopathy	12
Lipoma	11
Trauma, foreign body, dislocation – nail or claw	10

Swedish morbidity and mortality insurance data were also available from Agria for the Dobermann. Reported rates are based on dog-years-at-risk (DYAR) which take into account the actual time each dog was insured during the period (2006-2011). The number of DYAR for the Dobermann in Sweden during this period was between 500 and 1,000.

Swedish Agria insurance morbidity data

The most common specific causes of veterinary care episodes (VCEs) for Agria-insured Dobermanns in Sweden between 2006 and 2011 are shown in Figure 2. The top five specific causes of VCEs were skin tumour, skin trauma, vomiting/diarrhoea/gastroenteritis, pain/locomotor signs and dermatitis/pyoderma/folliculitis.

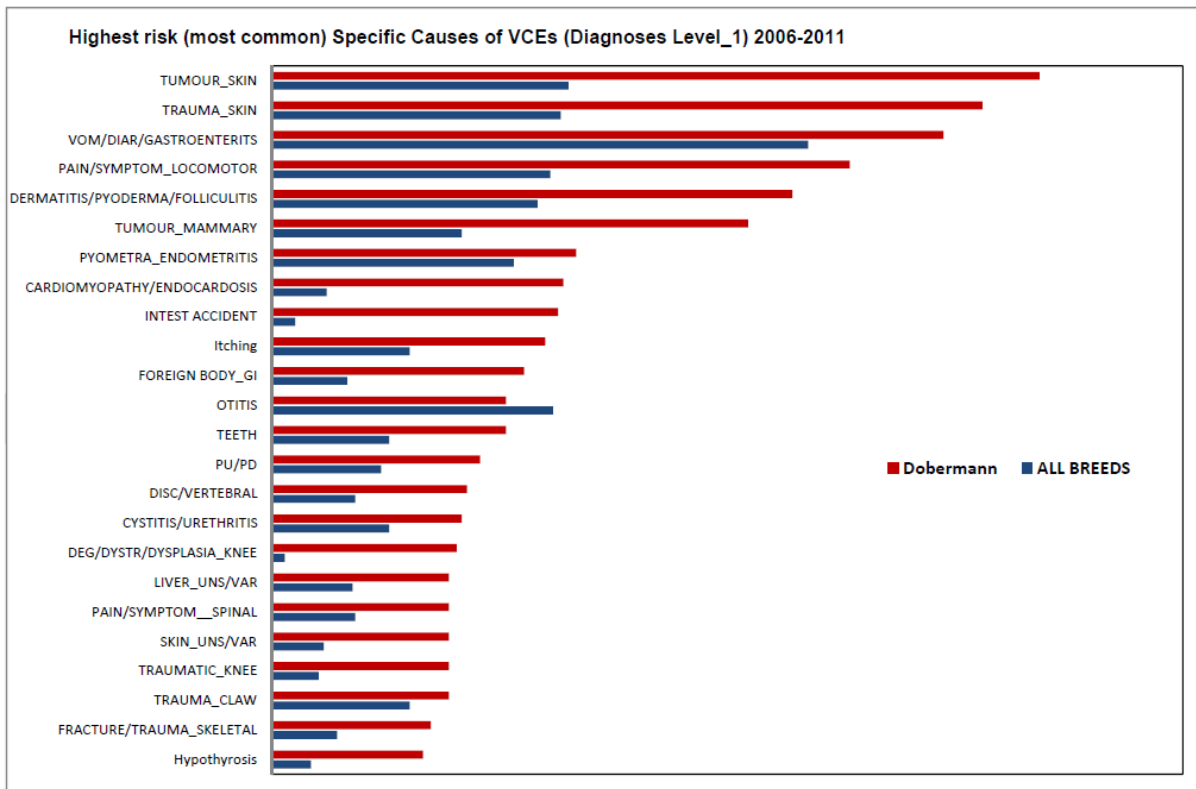


Figure 2: The most common specific causes of VCEs for the Dobermann compared to all breeds in Sweden between 2006 and 2011, from Swedish Agria insurance data.

When relative risk of specific causes of VCEs was compared for the Dobermann to all breeds, a couple of interesting findings were reported. The specific causes of VCEs ordered by relative risk are shown in Figure 3. In this analysis, the top five specific causes of VCEs ordered by relative risk were malformation or developmental disorder of spine, degenerative disease or dysplasia of the knee, intestinal accident, circulation, bleeding, oedema or infarct of the skin, and pain or signs associated with the hock.

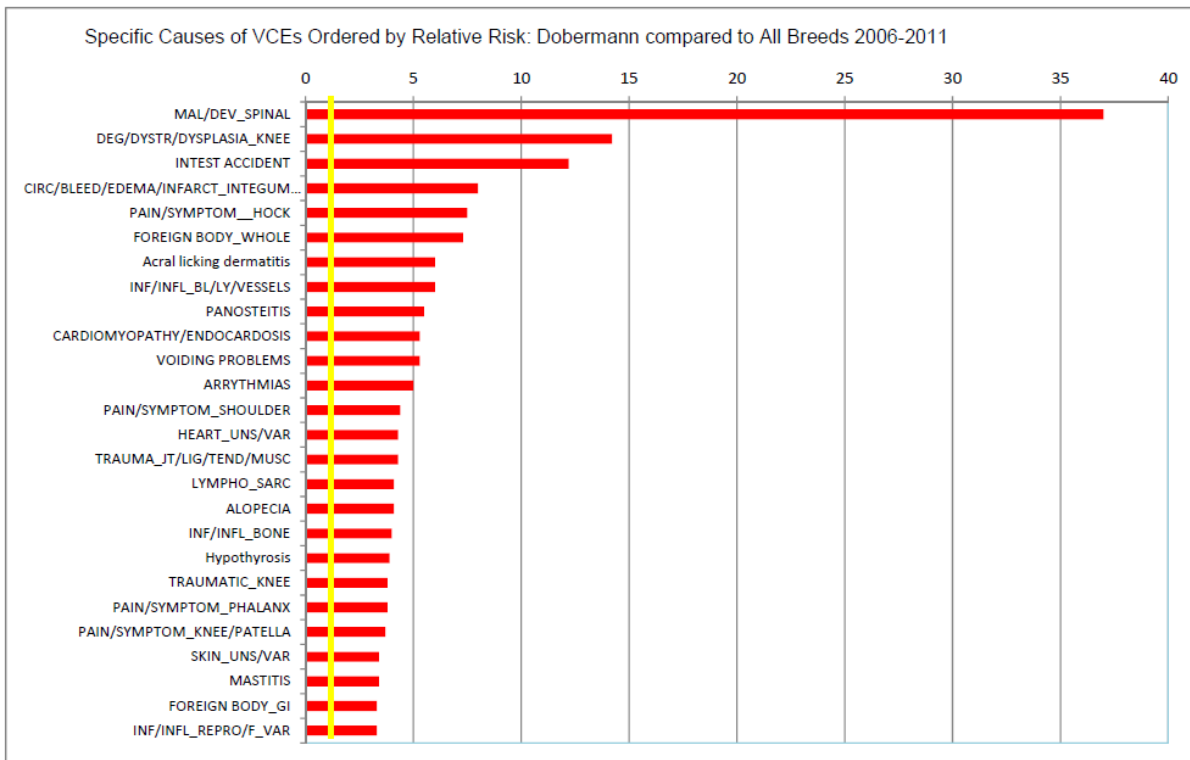


Figure 3: The specific causes of VCEs for the Dobermann ordered by relative risk compared to all breeds in Sweden between 2006 and 2011, from Swedish Agria insurance data. The yellow line indicates the baseline risk for all breeds.

Swedish Agria insurance mortality data

Median age at death for the Dobermann from Swedish Agria insurance data was 6.1 years for males and 6.6 years for females. Agria has a maximum age to which a dog can be life insured, which varies somewhat across breeds and years. Many owners also choose not to insure their dogs after a certain age, as the cost of the premiums become more expensive. For these reasons the median age at death from the Swedish Agria insurance data is artificially depressed for all breeds compared to that reported from surveys or other sources. The most common specific causes of death or euthanasia for Agria-insured Dobermanns in Sweden between 2006 and 2011 are shown in Figure 4. By far the two most common specific causes of death were cardiomyopathy/endocardiosis and disc/vertebral conditions.

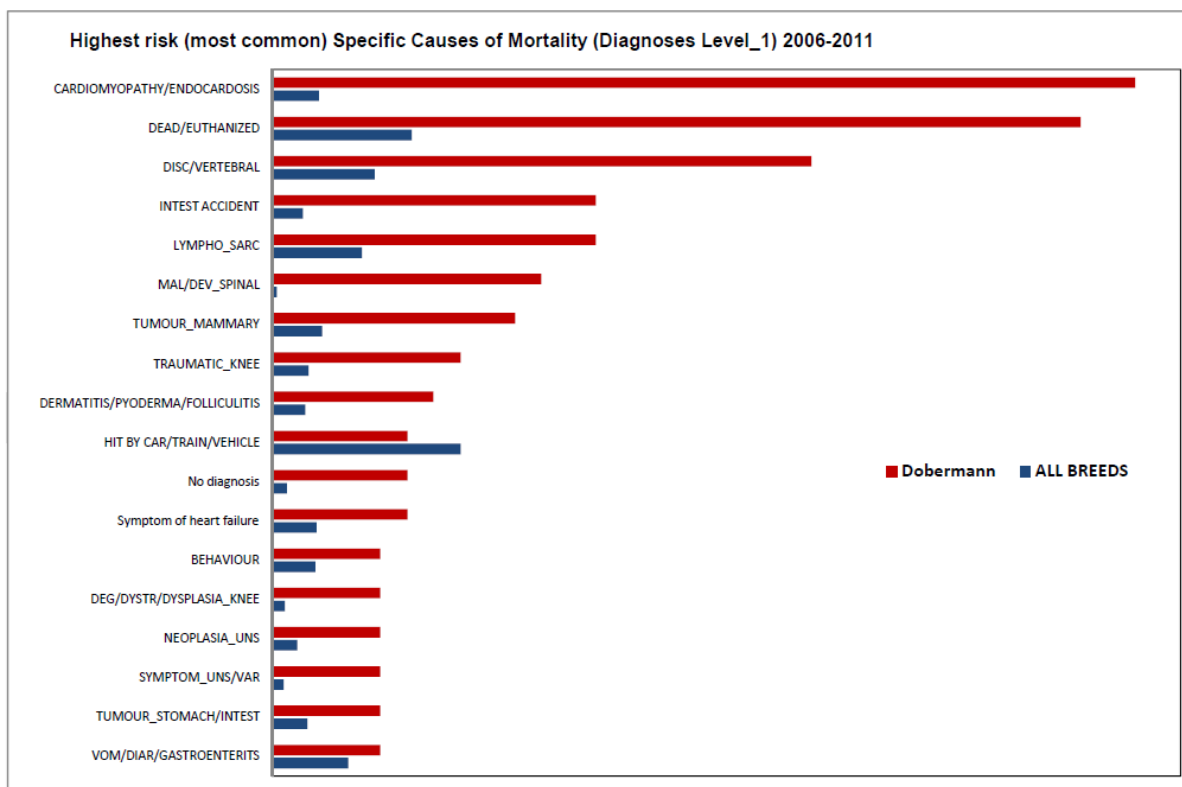


Figure 4: The most common specific causes of death for the Dobermann compared to all breeds in Sweden between 2006 and 2011, from Swedish Agria insurance data.

Breed-specific health surveys

No breed-specific health surveys were currently available.

Visual health check reports/clinical reports/judges' health monitoring

These are not mandatory for this breed, as they are not on Breed Watch category 2 or 3, and no optional forms have been received.

Breed Club health activities

The breed has an active Breed Health Coordinator, a breed health committee/group/council and dedicated health pages on eight of the 10 breed clubs' website. There is also the UK Dobermann Partnership site, which enables three of the clubs to work together and has the most comprehensive information. In addition there is a UK Dobermann Health FB page, supported by all the clubs, where information and discussion can be shared.

BHC annual report

The Breed Health Coordinators' Annual Health Report 2016 yielded the following response to 'please list and rank the three health and welfare conditions that the breed considers to be currently the most important to deal with in your breed': 1 dilated cardiomyopathy, 2 cancer (especially mammary tumours and lymphoma) and 3 pyometra.

In terms of what the breed has done in the last year to help address these listed health and welfare concerns the following responses were given:

1. Ongoing project with the University of Liverpool to evaluate the use of two biomarkers as an initial test for the presence of occult DCM, in the hope of developing an affordable annual test for owners. The breed clubs hold test sessions at club shows at a reduced price and available for pet owners as well as exhibitors, and actively encourage owners to test to ensure early diagnosis. It is advised that high biomarker results should be followed by an echocardiogram and Holter monitoring to establish conclusively whether there are signs of DCM. In addition to the research aspects of this project, it has raised awareness of the disease and the need to test, and many hundreds of dogs have now been tested, with a number of breeders now committed to annual testing and in some cases making results publicly available.

The breed are also participating in the Give a Dog a Genome project and hope to have two affected dogs sequenced with a view to identifying target genes for further research. They are currently on the list of breeds to be assessed by VetCompass with a view to getting up-to-date and accurate data on the current prevalence in the UK.

2. There are data from Scandinavia on the prevalence of mammary tumours in the breed that shows they are a high-risk breed and this has been publicised using social media sites aimed at breeders and pet owners. The breed clubs hope that more data regarding cancers (particularly lymphoma) will become apparent following participation in the VetCompass project.
3. There is information on the UK Dobermann Partnership web site on recognising and managing pyometra.

In the 2017 Annual Health Report the BHC listed the three health and welfare conditions as 1 DCM, 2 cancer, especially lymphoma, mammary tumours and osteosarcoma and 3 bloat/GDV. Actions given were continuations of those given in 2016, with the addition of monitoring of stem cell research at the Royal Veterinary College and liaison with the principal researcher regarding potential future clinical trials.

DNA test results

Under the Kennel Club's Assured Breeder Scheme (ABS), the DNA test for vWD is a requirement for the Dobermann. Results of this DNA test have been recorded since July 2003. The results for dogs which had been DNA tested up to 06/06/2018 are shown in Table 4.

Table 4: vWD DNA test results held by the Kennel Club for the Dobermann up to 06/06/2018.

Total number of results	Clear	Carrier	Affected	Hereditarily carrier	Hereditarily clear
6580	764	593	48	103	5072

The vWD mutation was patented in 2000, and the apparent mutation frequency for Kennel Club registered Dobermanns born in that year was approximately 20%. For dogs born in 2016, the apparent mutation frequency had dropped to approximately 1% indicating that good progress has been made.

Canine Health Scheme results and EBVs

Under the ABS, participation in the British Veterinary Association (BVA)/Kennel Club (KC) Hip Dysplasia Scheme is a requirement and eye testing (either through the BVA/KC/International Sheep Dog Society (ISDS) Eye Scheme or the European College of Veterinary Ophthalmologists (ECVO) Scheme) is a recommendation. All the BVA/KC Health Schemes are open to dogs of any breed, and the results for Dobermanns which have been presented for assessment under the Elbow Dysplasia Scheme are also shown below. Estimated breeding values (EBVs) are currently only available for breeds with large numbers of dogs with hip and elbow scores for the respective EBV.

HIPS

In total 989 Dobermanns have participated in the BVA/KC Hip Dysplasia Scheme in the 15 years to the end of 2016, and the median hip score received was 9 (range 0-64). The 5 year median score for the breed was also 9.

Hip score categories received by Dobermanns which participated in the BVA/KC Hip Dysplasia Scheme between 1990 and 2016 are shown in five year blocks (which can be considered to approximate to a generation) in Figure 5 below. The categories correspond to those assigned under the FCI (Europe)'s hip grading scheme; for one hip, a 'normal' hip scores 0-3, borderline scores 4-8, mild HD scores 9-18, moderate HD scores 19-30 and severe HD represents a score greater than 30. Further information on these categories can be found here:

[https://www.bva.co.uk/uploadedFiles/Content/Canine Health Schemes/chs-comparison-of-hd-schemes.pdf](https://www.bva.co.uk/uploadedFiles/Content/Canine_Health_Schemes/chs-comparison-of-hd-schemes.pdf)

Over this time period there appears to be a definite reduction in the proportion of Dobermanns with mild to severe hip dysplasia and an increase in those with borderline and normal scores.

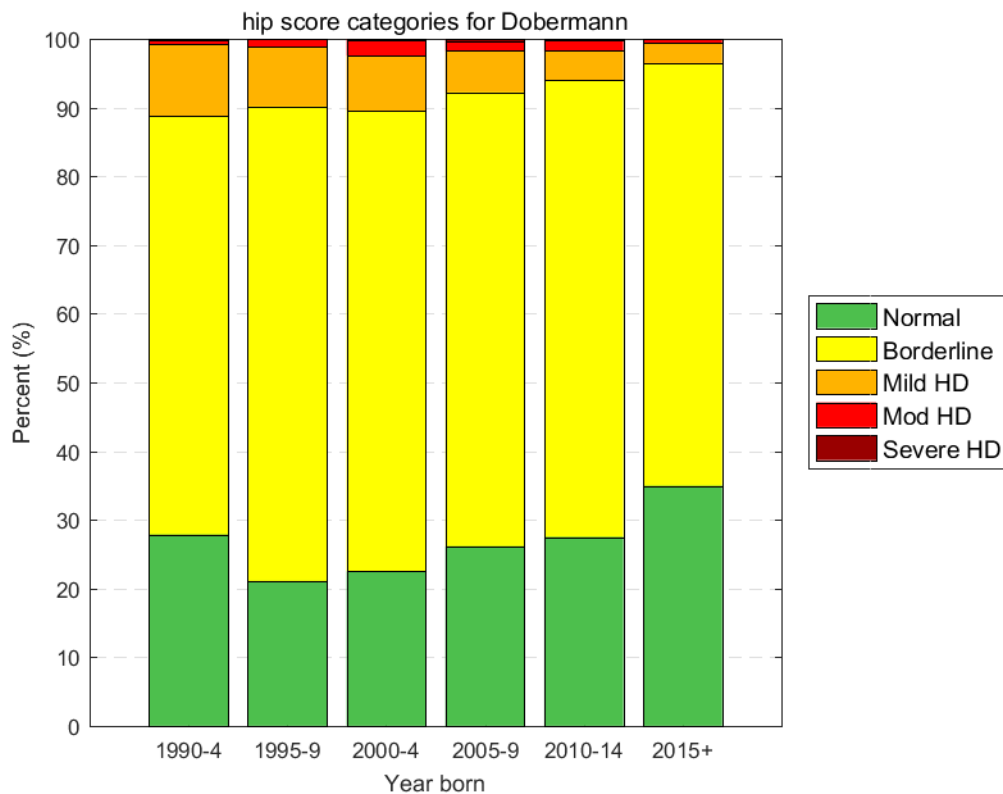


Figure 5 – Hip score categories for Dobermanns which participated in the BVA/KC Hip Dysplasia Scheme between 1990 and 2016, in 5-year blocks.

ELBOWS

Although participation in the BVA/KC Elbow Dysplasia Scheme is neither an ABS requirement nor recommendation, participation in the schemes is open to dogs of any breed. Elbow scores received by the 25 Dobermanns scored since the Scheme launched in 1998 are shown in Table 5. Just 4% (1 of 25 dogs of the breed) of Dobermanns participating in the scheme were diagnosed with some degree of elbow dysplasia.

Table 5: Elbow scores and number of dogs receiving those scores since 1998 for the 25 Dobermanns which have participated in the BVA/KC Elbow Dysplasia Scheme.

Elbow score	Number of dogs	Proportion
0	24	96.0%
1	1	4.0%
2	0	0
3	0	0

EYES

The breed is currently on Schedule A of the BVA/KC/ISDS Eye Scheme for PHPV, and on Schedule B for multi-ocular defects. Schedule A lists the known inherited eye conditions in the breeds where there is enough scientific information to show that the condition is inherited in the breed, often including the actual mode of inheritance and in some cases even a DNA test. Schedule B lists those breeds in which the conditions are, at this stage, only suspected of being inherited. The BVA also record the results of dogs of other breeds which have participated in the scheme. The results of Eye Scheme examinations of the breed, including PHPV affected results but also other conditions noted, which have taken place since 2012 are shown in Table 6.

Table 6: Reports on dogs of the breed which have participated in the BVA/KC/ISDS Eye Scheme since 2012

Year	Number seen	Comments
2012	76 adults 2 litters	1 – PHPV affected 6 – PPM 1 – nuclear cataract 1 – other cataract 2 – hyaloid remnant 8 – pigment on posterior capsule
2013	61 adults 0 litters	2 – PHPV affected 5 – PPM 5 – non-pigmented opacities on posterior lens capsule
2014	73 adults 0 litters	1 – PHPV affected 6 – PPM 1 – other cataract
2015	55 adults 0 litters	2 – PHPV affected 3 – PPM 3 – other cataract
2016	70 adults 0 litters	2 – PHPV affected 3 – PPM 2 – other cataract

Breed Club Recommendations

There are not currently any Breed Club breeding recommendations listed on the Kennel Club's website for the breed.

Reported caesarean sections

When breeders register a litter of puppies, they are asked to indicate whether the litter was delivered (in whole or in part) by caesarean section. In addition, veterinary surgeons are asked to report caesarean sections they perform on Kennel Club registered bitches. The consent of the Kennel Club registered dog owner releases the veterinary surgeon from the professional obligation to maintain confidentiality (vide the Kennel Club General Code of Ethics (2)). There are some caveats to the associated data; it is doubtful that all caesarean sections are reported, so the number reported each year may not represent the true proportion of caesarean sections undertaken in each breed. In addition, these data do not indicate whether the caesarean sections were emergency or elective. The number of litters registered per year for the breed and the number and percentage of reported caesarean sections in the breed for the past 10 years are shown in Table 7.

Table 7: Number and percentage of litters of Dobermanns registered per year and number of caesarean sections reported per year, 2007 to 2017.

Year	Number of Litters Registered	Number of C-sections	Percentage of C-sections
2007	310	0	0
2008	252	0	0
2009	226	0	0
2010	246	0	0
2011	193	3	1.6%
2012	174	19	10.9%
2013	166	21	12.7%
2014	138	8	5.8%
2015	186	15	8.1%
2016	174	14	8.1%
2017	191	17	8.9%

Genetic diversity measures

The effective population size is the number of breeding animals in an idealised, hypothetical population that would be expected to show the same rate of loss of genetic diversity (rate of inbreeding) as the population in question; it can be thought of as the size of the 'gene pool' of the breed. In the population analysis undertaken by the Kennel Club in 2015, an estimated effective population size of 133.4 was reported (estimated using the rate of inbreeding over the period 1980-2014). An effective population size of less than 100 (inbreeding rate of 0.50% per generation) leads to a dramatic increase in the rate of loss of genetic diversity in a breed/population (Food & Agriculture Organisation of the United Nations, "Monitoring animal genetic resources and criteria for prioritization of breeds", 1992).

Annual mean observed inbreeding coefficient (showing loss of genetic diversity) and mean expected inbreeding coefficient (from simulated 'random mating') over the period 1980-2014 are shown in Figure 6. As with most breeds, the rate of inbreeding was at its highest in this breed in the 1980s and 1990s. This represents a 'genetic bottleneck', with genetic variation lost from the population. However, since 2000 the rate of inbreeding has been negative, implying moderate replenishment of genetic diversity (possibly through the use of imported animals). It should be noted that, while animals imported from overseas may appear completely unrelated, this is not always the case. Often the pedigree available to the Kennel Club is limited in the number of generations, hampering the ability to detect true, albeit distant, relationships. For full interpretation see Lewis et al, 2015 <https://cgejournal.biomedcentral.com/articles/10.1186/s40575-015-0027-4>.

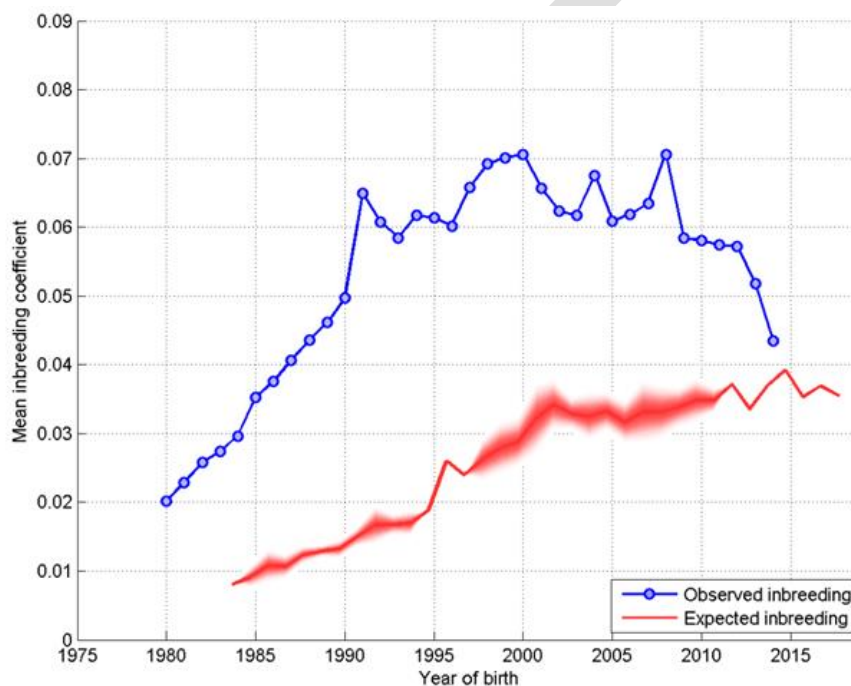


Figure 6: Annual mean observed and expected inbreeding coefficients. [The blurring around the expected inbreeding line indicates an approximate standard deviation around the estimate, in breeds with more than 2000 individuals born in a given year.]

The current annual breed average inbreeding coefficient is 4.3%. This value is calculated each June and represents the average inbreeding coefficient of all dogs of the breed registered between January and December of the previous year i.e. in 2016.

Below is a histogram ('tally' distribution) of number of progeny per sire and dam over each of seven five-year blocks (Figure 7). A longer 'tail' on the distribution of progeny per sire is indicative of 'popular sires' (few sires with a very large number of offspring, known to be a major contributor to a high rate of inbreeding). It appears that the extensive use of popular dogs as sires has eased a little (the 'tail' of the blue distribution shortening in figure 7).

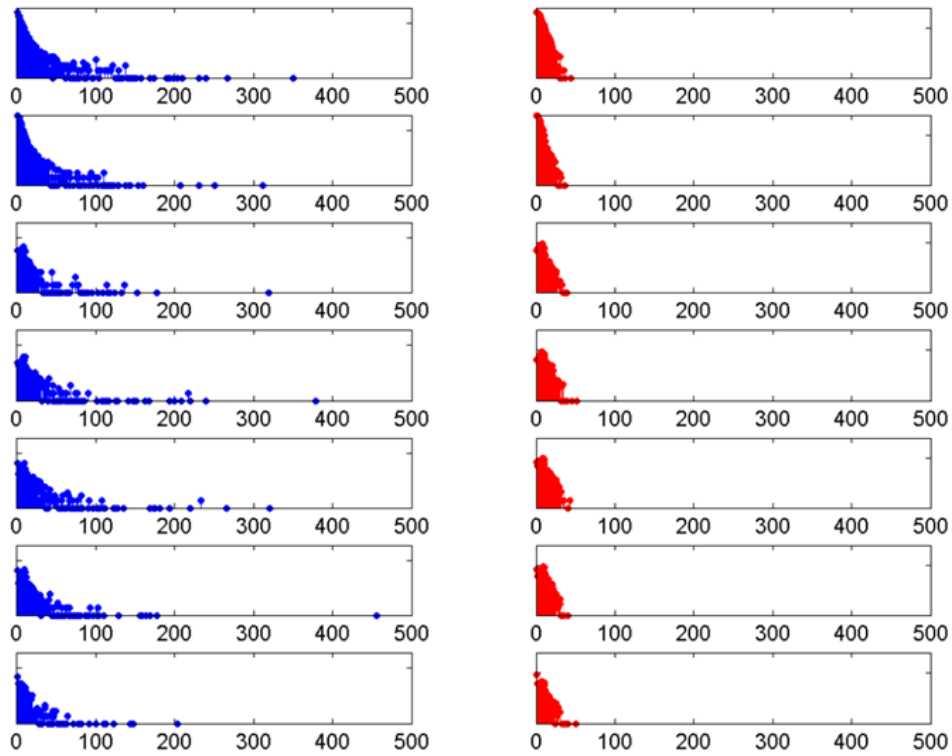


Figure 7: Distribution of progeny per sire (blue) and per dam (red) over 5-year blocks (1980-4 top, 2010-14 bottom). Vertical axis is a logarithmic scale.

Current research projects

The Dobermann is one of the breeds in the AHT's Give a Dog a Genome project; the health conditions given as concerns in the breed were dilated cardiomyopathy, lymphoma, mammary tumours and pyometra. One individual with DCM and one health control for the condition are being sequenced, and the data are being shared with Professor Leeb in Bern and Dr. Dukes-McEwan at Liverpool.

Dr. Dukes-McEwan at the University of Liverpool is leading ongoing research into DCM in the breed.

SECTION 2: PRIORITIES

A meeting was held with Dobermann breed club representatives on 1st June 2018 to discuss Section 1 of the BHCP and agree the priority issues for the health of the breed.

The only reported behavioural condition for the breed was canine compulsive disorder which was noted in two studies, however, no prevalence data were available. The group discussed this and the examples provided were not considered to represent an issue; it is considered a common behaviour for the breed, rather than a disorder.

The cardiac conditions category included four conditions, the most significant of which was DCM. The group agreed that DCM is a major concern for the breed, and there are a number of projects underway by the breed working in collaboration with cardiologists. Discussion was had over detection, short term management and treatment, alongside the long term goal of prevention. Ongoing research projects in all these areas were discussed.

Dermatological conditions had four conditions noted for reference, but do not appear to be highly significant for the breed.

The endocrine condition listed was hypothyroidism, which is the most common endocrine condition across a number of breeds. The Dobermann is considered particularly susceptible, but again there are no prevalence estimates.

The only gastrointestinal condition listed was GDV which appears to be a problem across a number of deep chested larger breeds. The group discussed how anecdotally the incidence has decreased with increased owner awareness, or certainly reporting, as owners are able to detect warning signs and institute treatment before they progress.

The haematological condition noted for Dobermann was Von Willebrand's disease (vWD), the most common heritable canine bleeding disorder. The mutation causing type I in the Dobermann has been identified and a DNA test is available. To date 6,580 Dobermanns have been DNA tested for this. As described in the document the use of this DNA test has led to a marked decrease in the allele frequency, which has dropped from 20% when the test was patented in 2000, to 1% in 2016.

Some discussion was had over chronic hepatitis in the breed, as there is debate over the aetiology of the condition. It is hoped that the ongoing research into the condition being done overseas will clarify this.

In the musculoskeletal conditions category, carpal laxity and panosteitis are both self-limiting and were not considered to be of great importance. There was some discussion over hip and elbow dysplasia, which was then considered further with respect to the BVA/KC results available to date. The hip scores appear to be improving overall, as shown in figure 5 in the document, with most dogs receiving normal/borderline results in the most recent years. The current number of results for the breed is too low for EBVs to be made available for the breed.

There were seven neoplastic conditions found in the literature as possible predispositions for the Dobermann, of which mammary tumours and lymphoma were considered to be priorities for the breed by the group.

Considering the seven neurological conditions listed in the literature review, cervical spondylomyelopathy (Wobblers syndrome) and congenital deafness and vestibular dysfunction (DINGS) were both considered priorities for the breed, and appear in multiple evidence sources.

For both ocular conditions listed, the Dobermann is on either schedule A or B for and monitoring these conditions, with relatively low numbers appearing affected in the UK population.

Reproductive conditions included prostate disease in a single study, however it was not seen as a common condition in the UK population when discussed with the group. Pyometra was also listed, from a Swedish study; however no UK data are available.

Urological conditions found in the literature review included familial renal disease and urolithiasis, which had not been seen in the UK population, the former had not been noted since 1970s in any literature. Urinary incontinence had been seen in spayed bitches. The 2004 and 2014 Purebred and Pedigree Breed Health Surveys and insurance data generally supported the findings of the literature review.

Genetic diversity was briefly discussed, but with an estimated effective population size of 133.4, this is not considered a priority for the breed at the moment; however, the breed should not become complacent. As with other breeds there was an increase in the inbreeding coefficient in the late 80s and early 90s, which coincides with popular sire use. Reducing popular sire use is the fastest way to reduce the rate of inbreeding for a breed. Discussion was had over popular sires and health testing outside of the breed clubs; this is part of a much wider debate, however it was agreed that education is the key to influence and educate puppy buyers and breeders.

The group agreed from the information provided and their own experience that DCM, cancer (particularly lymphoma and mammary tumours) and Wobblers syndrome were the priorities for the Dobermann with DINGS and hypothyroidism to be at watch.

SECTION 3: ACTION PLAN

- The Kennel Club and breed clubs to monitor DCM research from the University of Liverpool and the Royal Veterinary College.
- The Kennel Club to facilitate a meeting with the Edinburgh research group, with regard to DCM/longevity research aimed at producing EBVs.
- The Kennel Club and breed clubs to work towards agree breeding guidelines for DCM.
- The Kennel Club and breed clubs to investigate whether there is any further current research into the management or cure of DCM.
- The Breed Clubs to submit any additional breeding guidelines they wish to be noted on the Kennel Club's website.
- The Breed Clubs to submit their suggested changes to eye testing frequency.
- The Kennel Club to assist in a breed survey as necessary, dependent on the outcome of discussions with the Edinburgh research group.
- Breed clubs to encourage uptake of the longevity programme.
- The Kennel Club and breed clubs to monitor DINGS and hypothyroidism in the UK and any associated research.
- The Kennel Club to investigate any current research into Wobblers syndrome.
- The Kennel Club will review progress with the Dobermann breed club representatives in June 2019.

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