

Copper Toxicosis in Dalmatians

Copper toxicosis (“CT”), (sometimes referred to as copper storage disease), is an inherited disease in which excessive levels of copper accumulate in the liver. Although copper is an essential element in the diet of dogs and other animals, it is intrinsically a highly toxic substance. The body copes with this by means of the liver utilising the small quantities required, and harmlessly excreting any excess copper as a component of bile. When this regulatory mechanism fails, copper progressively accumulates in the liver and can lead to it being irreversibly damaged. If left untreated, the prognosis can be poor, and the condition can be fatal. Affected dogs can be accumulating toxic levels of copper, and may be suffering the early stages of permanent liver damage, without displaying any clinical symptoms. When displayed, symptoms may include:

- Lethargy.
- Depression.
- Anorexia.
- Weight loss.
- Vomiting.
- Diarrhoea.
- Excessive thirst and urination (polydipsia and polyuria)
- Abdominal distension due to fluid build up in the abdomen (ascites)
- Increased levels of certain liver enzymes being released into the bloodstream

A number of other conditions can give rise to one or more of the listed symptoms, so they are not in themselves definitive of CT. A definitive diagnosis can **only** be made via examination of a liver biopsy.

Treatment for a dog diagnosed with the condition often combines drug therapy with feeding a copper-restricted diet. Unfortunately, treatment is not always successful if the disease is so far advanced that the liver has suffered too severe damage.

A limited number of cases of CT in Dalmatians have been recorded in the US, Canada, Australia, and elsewhere. Another case was previously identified by researchers at Cambridge Veterinary School via a retrospective study of histology samples sourced from a number of accredited UK histology laboratories.

Most importantly, the first case in the UK of a living Dalmatian being diagnosed via a liver biopsy as having CT occurred in early 2015. The dog received drug therapy, but sadly died after a short time. Interestingly, a close relative had died previously, having displayed very similar clinical symptoms, but one must be cautious in drawing conclusions without definitive evidence of a clear diagnosis.

....So how prevalent is CT in UK Dalmatians?

The truth is that we have no idea. It might be 1 in a million, 1 in a thousand, 1 in a hundred, or even more. In a breed like Dalmatians, where historically CT has had little recognition or even consideration as a Breed-related condition (and in the UK, arguably none?), it would not be surprising if there had been prior cases of dogs presenting with some of the above symptoms, the origin and cause of which had passed undiagnosed. Being realistic, the likelihood of the disease itself might not even have been considered, and even less likely a liver biopsy necessary for a diagnosis. UK academics specialising in this field have acknowledged that this possibility cannot be discounted. The fact that there have been only 2 positively diagnosed cases is no reflection whatsoever on the actual prevalence of the disease in the Breed.

CT is a very serious disease and one where irreversible damage to the liver can be caused before any outward clinical signs of the disease are observed. Even if it has only a low prevalence in the Breed, then it is timely to begin to try to address it now. Inherited diseases with a low prevalence and a simple mode of inheritance are the most easy to manage and to eliminate without serious impact on the gene pool.

....So what can be done to address CT?

Most importantly, there is no short-term ‘fix’.

CT is most commonly associated with Bedlington Terriers, where the condition is understood to be caused by an autosomal recessive gene. This means that a dog can only develop the disease if it carries 2 copies of the relevant mutant gene. In 2002, Dutch scientists announced the discovery of the gene causing CT in Bedlingtons (known as COMM1), and in 2005 the AHT developed a DNA test for this gene. However, since that time there has been a number of anomalous results which has led to suggestions of a second

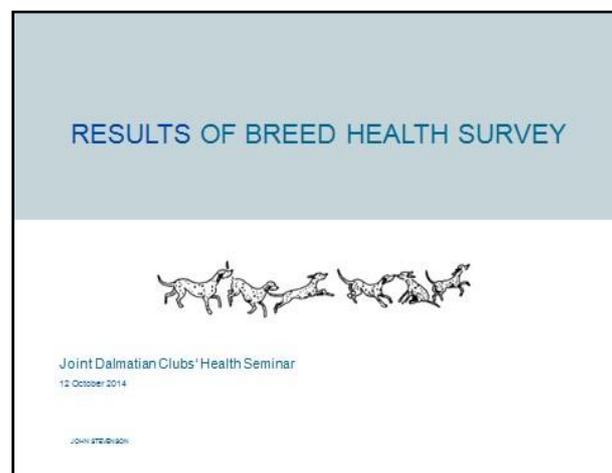
responsible gene which can cause the disease, and indeed the identification of such a second gene was reported in a publication in 2016.

There is no reason to suspect that the genetic origin of the disease in Dalmatians is the same as that in Bedlingtons. Indeed, I have been advised that it is unlikely to be so, which means that the DNA test applicable to Bedlingtons is not likely to be of relevance to Dalmatians. (By way of further example, the genetic basis of CT in Labradors is different to that of Bedlingtons).

Going forward, we must first accept that copper toxicosis does exist in Dalmatians. There is no cause for great alarm, but it is important to maintain an awareness of the symptoms, and perhaps raise the subject with your vet. if your dog exhibits relevant symptoms. Should a case of CT come to light, it is essential to report it so that appropriate steps can be taken to collect DNA samples from the affected dog and its siblings/parents/offspring.

For more information on CT, (as it relates to Bedlingtons), and in a very 'readable' form, visit <http://www.bedlingtonterrierhealthgroup.org.uk/> and follow the link to 'copper toxicosis' and then 'CT - the Disease'.

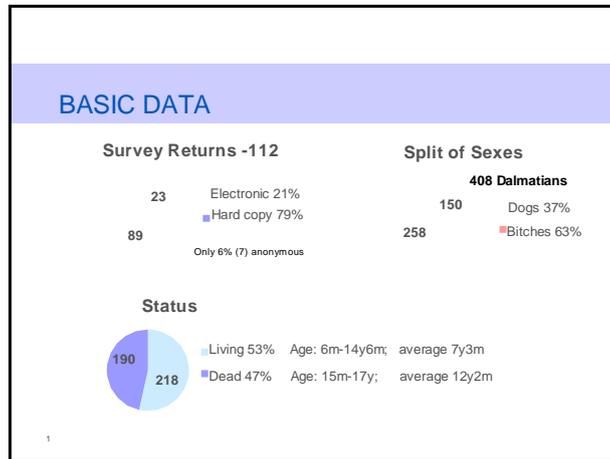
John Stevenson



The last UK Dalmatian Breed Health Survey was conducted in 2004 as part of an all-breeds survey carried out under the auspices of the Kennel Club and the British Small Animal Veterinary Association. The results of that survey with regard to Dalmatians is available at <http://www.thekennelclub.org.uk/media/16394/dalmatian.pdf>. After such a time lapse, therefore, it was an appropriate to conduct a further survey.

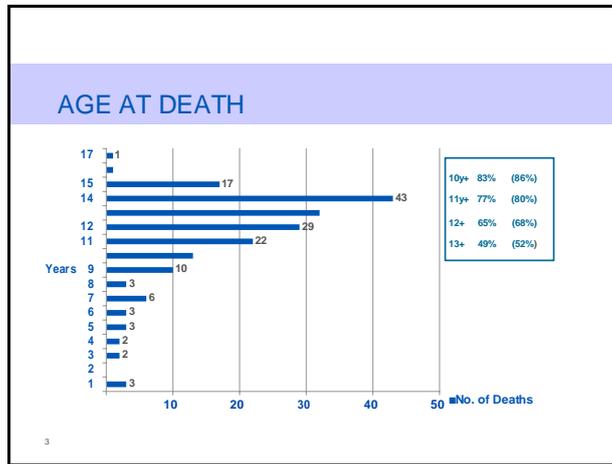
The purpose of any health survey is not to be able to say that '*x% of Dalmatians suffer from disease a, and that y% suffer from disease b*'. There are always factors in **any** survey which can, and generally do, give rise to biased or skewed results, and conclusions like these are dangerous ones to draw. The true benefits of surveying health come from periodically repeating the survey in order to monitor trends (for better or worse) in recognised conditions, whilst at the same time being watchful for 'new' diseases or conditions that might appear and which might not have been associated previously with Dalmatians.

Accordingly, this first survey was directed at those diseases generally associated with Dalmatians or which might be suspected (anecdotally, perhaps) of having a higher than average incidence compared with breeds generally. The over-riding objective was to establish a 'base line' for these conditions, against which changes could be monitored. In order to capture a 'generation' of data (roughly), the survey covered Dalmatians which had been living at any time between 01 Jan 2000 and 30 Apr 2014.



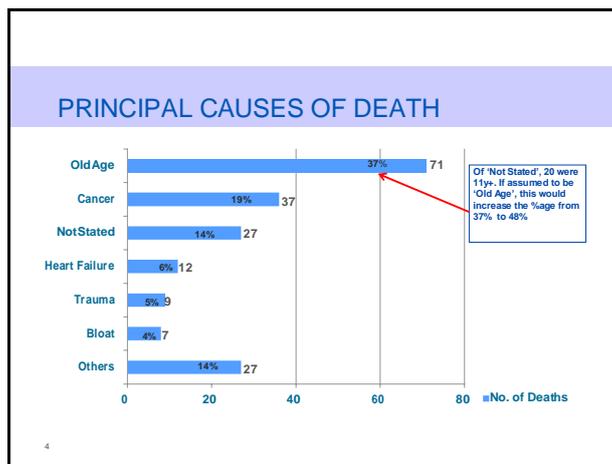
The survey was made available to UK Dalmatian Breed Club Members via the members' section of the British Dalmatian Club website, or via a dedicated email address. Disappointingly, the response was exceptionally poor, despite repeated appeals, until a hard copy mailing was provided. It was somewhat surprising that respondents apparently preferred the tried and trusted paper method!

The above slide shows a breakdown of the basic demographic data. Whilst the opportunity was available for the survey to be returned anonymously, only 7 were returned in that manner. The survey return rate equated to approximately 28%, which compares quite favourably with that for the 2004 survey (30.6%), and covered 408 Dalmatians of which 218 were living and 190 had died.



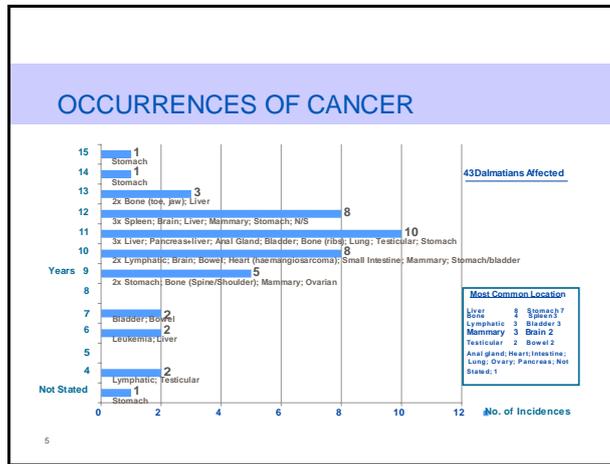
The above chart for ‘age at death’ is rather pleasing in what it illustrates. Essentially, Dalmatians are a long-lived breed and, impliedly, essentially a healthy one also!

65% of Dalmatians died at an age of 12+, and 49% at 13+. If traumatic deaths (e.g. road traffic accidents) are eliminated, (and reasonably so, as they do not represent death due to deteriorating or ill health), then these percentages rise to almost 70% for deaths at 12+ and over 50% for 13+.



The four principal causes of death remain the same as they were in the 2004 survey. Clearly the most common cause of death is ‘old age’ and issues to it. Many respondents qualified their response in this category with comments like ‘went off legs’, ‘unable to stand’, ‘general debility’, ‘incontinence’, and so on.

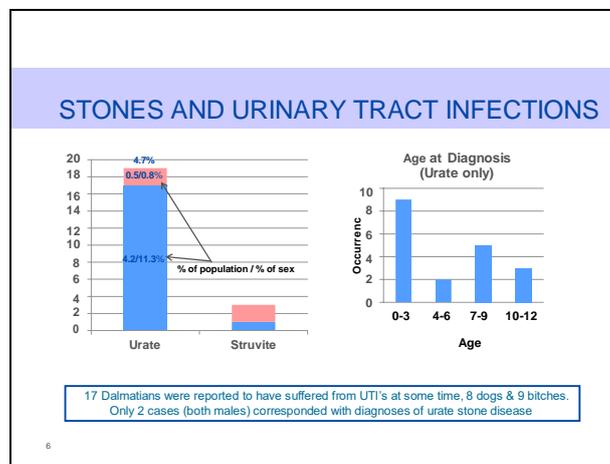
No actual cause of death was recorded for 27 Dalmatians (14% of deaths). One can understand that some Dalmatians will have died without a known cause. However, 20 of the 27 Dalmatians in this category died at 11+ years. It is surely not unreasonable that some of these deaths might equally have fallen into the ‘old age’ category. If these 20 are added in, then the proportion of deaths due to old age would rise to 48% - almost half of all deaths. There is not a truly sound basis for this conclusion, however, and it would probably be more appropriate to conclude that the incidence of death due to old age lies between the two figures of 37% and 48%.



The above chart correlates age and numbers, when cancer was diagnosed, and records also the affected organ.

It will be noted that whilst 37 deaths have been attributable to cancers (see previous chart), 43 Dalmatians have been affected with the disease. 4 Dalmatians subsequently died of other unrelated conditions (related to old age), having suffered from testicular (x2), mammary (x1) and bone (toe) (x1) cancers. Perhaps it was the case that these were successfully treated by surgery – certainly that applies to two of the cases, one testicular and the bone cancer incident, (both affected Dalmatians owned by the author), which were respectively treated successfully by castration and amputation.

That also means that 2 Dalmatians have suffered from cancers, and are still living.



The overall reported incidence of 4.7% compares with an estimated figure of between 1.1-3.5% from the 2004 data (minimum and maximum estimates derived from epidemiologist analysis). Not surprisingly, the prevalence of the condition in males is higher than that in females, but it should be noted that bitches can and do form urate stones, though at a significantly lower frequency.

Of the incidences of urinary tract infections, only two cases coincided with a diagnosis of urate stones. Accordingly, UTI's appear not necessarily to be a reliable early warning or symptom of possible stone formation. It had been anticipated that there might have been a more frequent correlation between the two conditions.

SEIZURES

Little evidence available of the incidence in Dalmatians

- 8 positive results, 3 at age 2y, 1 each at 4y, 5y, 6y, 10y and 13y
- Recurrent in 4 cases (2 at age 2y, 1 at 5y, 1 at 10y); others single instance

Many causes of seizures, including poisons, brain tumours, brain trauma, physiological imbalance, liver disease, kidney failure.

Also, can be hereditary

Too small a sample, and a very small absolute number of affected dogs to permit any meaningful analysis

7

Although there have been cases of canine seizures in Dalmatians, the number of positive returns numbered only 8, which is far too small a number to warrant any more detailed analysis. Of the reported cases, which first occurred at ages varying from 2y to 13y, half led to recurrent seizures whilst the other 4 constituted one-off events. The latter can be induced by transitory effects, including poisoning, one of these cases having been diagnosed as such.

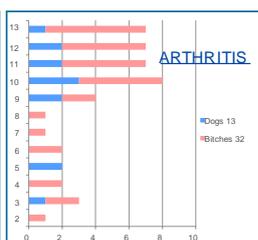
MUSCULO-SKELETAL DISORDERS - 1

HIP DYSPLASIA

7 Cases of Dalmatians diagnosed with HD, at ages of 9m, 2y, 4y, 9y (x2), 10y, and N/S.

Small number, small sample, but

Breed average score (BVA/KC Scheme)
11.2



8

HD

Routine scoring of Dalmatians for HD under the KC/BVA Scheme does not take place currently in the UK. Up to early 2014 just 193 Dalmatians had been scored. Scores range from 0 to 96 (maximum 106) with a breed average of 11.2. Given that the second highest score is 32, the score of 96 is an exceptional case. If this exceptional case is discounted, then the Breed average to date would be 10.8, so its impact on the Breed average is relatively small. The Dalmatian affected with this high score enjoys a good quality of life, thanks largely to its owner's management of the dog's condition. It is hoped (anticipated) that the owner will record these experiences to assist others in the future who might be unfortunate to have a Dalmatian which suffers from the effects of HD.

7 cases of diagnosis of HD were reported in the survey. Though on the one hand this is a small number, the condition can be a debilitating one which should be taken seriously. The consensus of attendees at the Seminar was that more consideration should be given to scoring hips.

Arthritis

45 Incidences (11%) of diagnoses of arthritis were reported. The majority of these affected Dalmatians in later in life, but it should not be overlooked that younger dogs were affected by the condition, one as young as 2y.

MUSCULO-SKELETAL DISORDERS - 2

ELBOW DYSPLASIA

No positive returns

BVA/KC ED Scheme

Range of possible scores: 0-3

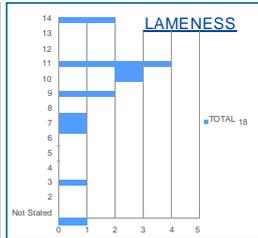
Advice: breed only from zero scored

Only 36 Dalmatians scored.

32 scored 0

3 scored 1

1 scored 2



9

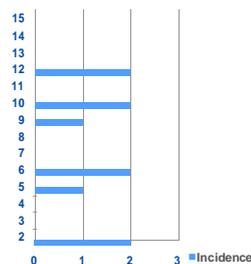
ED

Elbow dysplasia is not commonly associated with Dalmatians, which probably explains why only 36 Dalmatians have been scored since the inception of the KC/BVA Scheme. Of those 2 Dalmatians have scored 1 whilst one has scored 2 (the maximum). Recognising that the condition tends to worsen with time, the BVA advice is that only dogs with a score of zero should be bred from.

Lameness (recurrent)

This data was collected for statistical purposes only, in order to obtain an indication as to how common was the condition. More detailed conclusions could only be considered with further information relating to cause (where known). Nonetheless, it is interesting to observe that, with one exception, the majority of cases occur in mid- to later age.

BLOAT



- 15 Dalmatians suffered bloat (9 dogs, 6 bitches)
- All but 1 a single episode
- One bitch had 4 episodes
- 7 Deaths from bloat.....
-which means 8 survived, including the multi-episode case

10

Without question, bloat (gastric torsion) is a life-threatening event, requiring speedy action. Indeed, 7 of the 15 reported cases resulted in death. Rapid intervention (which of course requires that the owner happens to be present at the initiation of the event) enables the condition to be controlled and rectified, often via surgical intervention. Statistics show that surgical intervention decreases significantly the risk of a recurrence.

MEGAESOPHAGUS

- Only 2 cases reported in survey
- 3m Bitch and 5y dog
- Neither case resulted in death

11

Only 2 incidences were reported. The condition is more usually seen in very young dogs, so it is interesting to see that one instance related to a 5y bitch. If these statistics are representative of the breed as a whole, then they are encouragingly very low.

SKIN CONDITIONS

Condition	Incidence	Percentage of Population	Percentage of All Incidences	Observations
Alopecia	1	0.25	1.3	
Non-itchy Dermatitis	59	14.5	76.6	44 aged 2 or less on first occurrence
Itchy Dermatitis	10	2.4	13.0	
Skin Parasites	7	1.7	9.1	2 'fox'; 1 'fox mites' 2 'mange'

12

In parallel to the 2004 survey, an analysis was made of the incidence of conditions and diseases resulting in insurance claims. In this respect, it transpired that the most common disease was 'skin conditions'. The information in the slide above was sought in order to obtain an indication of the level of these instances which might have been nothing more than non-itchy dermatitis, or what many Dalmatian breeders and owners would commonly refer to as 'Dally Rash'. Experienced owners would normally not seek veterinary intervention for such a condition, recognising that it generally passes with time, and does not cause the dog any irritation or other distress.

The current data indicate that $\frac{3}{4}$ of all cases were for 'non-itchy dermatitis', which first occurred in 75% of cases at age 2y or less.

Survey Limitations and Looking to the Future

Example current limitations:-

- Identifying sample (i.e. owners)
- Limited sample number
- Distribution of surveys & cost
- Generating returns
- Skewed returns, especially towards 'affected' animals
- Non-veterinary diagnoses

13

The first problem presented by traditionally survey is to identify the sample i.e. the owners to whom the survey can be directed. In this regard, the only group which could be identified readily were Breed Club Members, whose contact details are known and available within the Clubs. Whatever method of distribution is chosen, the sample size will be relatively small compared to the Dalmatian population, and the number of responses smaller still. In addition, it is human nature that responses will be forthcoming more often from owners of dogs which have suffered one or more incidences of ill health, whilst those with 'healthy' Dalmatians do not necessarily trouble to respond. This inevitably results in skewed returns, which limits the ability to accurately estimate incidence levels. Yet without a true incidence level, one cannot appreciate the importance and seriousness of a given condition within the breed. For this reason, and as stated earlier, surveys should be repeated at intervals, and trends monitored. A limitation of surveys, normally, is that a not insignificant part of the returns is based upon owners' self-diagnoses. There is nothing wrong with this, though one must accept the degree of subjectivity involved.

All this, however, might change dramatically in the future with the advent of **VetCompass**.

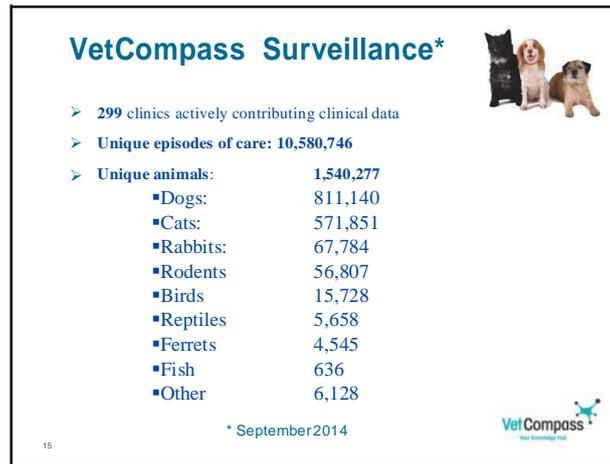
VetCompass – the Future of Health Surveys?

What is it? How does it work?

- Pioneered by a team at the RVC led by Dr Dan O'Neill
- A piece of software – but with a very sophisticated use!
- Utilises software embedded in vet. practice systems
- Anonymous data collected, demographic and episodes of care
- No action or intervention by practice required
- Includes episodes throughout patients' lives
- Data includes 'healthy' animals – every practice-registered animal
 - Neutering, wormers, dog food, vaccinations etc.

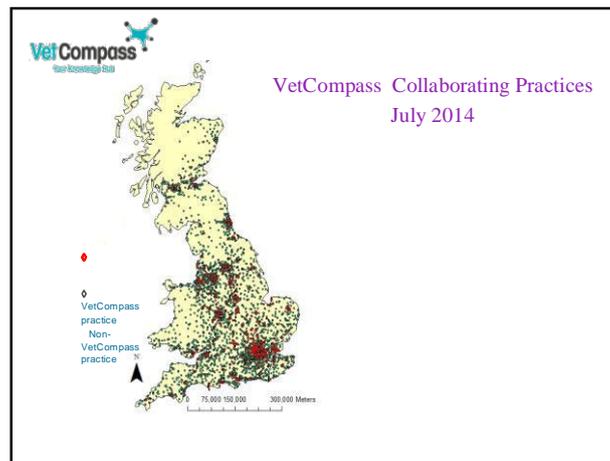
14

The VetCompass concept utilises a software programme embedded in the IT systems of veterinary practices, which collects and records data relating to all registered patients. The data is rendered anonymous yet traceable to the individual owner/animal during collection. The data includes demographic and care episode information, and importantly records this information for healthy animals also (hence the data is not biased in any way), and for all animals over their entire lifetime. If the animal is permanently identified (microchipped), then the system will even detect transfers to another veterinary practice! An added immediate benefit is that the concept benefits from statistics which are entirely based upon veterinary diagnoses.



Slide kindly provided by Dr Dan O'Neill. © D O'Neill

For such a relatively new concept, VetCompass is already in use in over 300 practices today in the UK, and is also being introduced into Australia and the USA. As can be seen above, the resource of patients already includes in excess of 800,000 dogs. As a 'taster' of the scope of information available and the potential of VetCompass, some simple demographic data show that these include over 3100 Dalmatians, ranking them at position 41 in terms of breed popularity, (No.1 being Crossbreeds and No.2 Labradors, and interestingly just below Patterdale Terriers which are at No. 39!). The sample of Dalmatians had an overall median weight for those aged over 1.5yr of 29.9 Kg, and median weights of 32.0 Kg for dogs and 27.5 Kg for bitches.



Slide kindly provided by Dr Dan O'Neill. © D O'Neill

Though the database of VetCompass information is already very large, it presently covers a relatively small proportion of UK veterinary practices. As it inevitably spreads more widely, it will result in an even larger sample size and an even higher degree of confidence in the results of statistical analyses derived from it, which are in any event far superior to anything currently available.

VetCompass Data shared: VetCompass

Identifier	Demographic	Clinical
Group ID	Species	Date of care
Clinic ID	Breed	Clinical Exam text
Vet ID	Sex	Temperature
Owner ID	Neutered	Owner - Symptom
Animal ID	Date of birth	Vet - Presenting sign
Visit ID	Colour	Vet - VeNom diagnosis
Microchip number	Weight	Treatment
Partial postcode	Insured Yes/No	After 11 pm
	Deceased date	Discharge status

Slide kindly provided by Dr Dan O'Neill. © D O'Neill

The above slide illustrates the extensive range of data and information which is collected by VetCompass, and gives an indication of the scope of types of analysis of demographic and care episode data which are possible. This will provide a vital tool to understanding in greater detail not only the conditions and diseases which affect Dalmatians, but their true and accurate prevalence in the breed. This in turn will enable a health strategy to be drawn up in order to seek to mitigate their occurrence.

Traditional Survey vs VetCompass	
Traditional	VetCompass
1. Identifying sample	1. Passive and automatic
2. Limited sample number	2. Massive sample
3. Distribution of surveys	3. Automatic/not applicable
4. Generating returns	4. Automatic, complete population
5. Skewed returns	5. Not possible, eliminated
6. Non-professional diagnoses	6. Totally professional diagnoses

18

Put quite simply, VetCompass overcomes and eliminates **all** the limitations of traditional 'voluntary' surveys. It provides a true interpretation of incidence levels which are derived from a very large and representative (unbiased) sample.

VetCompass is surely the future of canine health survey information.

John Stevenson

© 2014

KC BAER HEALTH SCHEME



Joint Dalmatian Clubs' Health Seminar
12 October 2014

JOHN STEVENSON

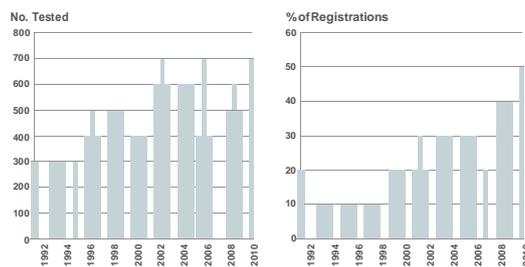
UK BAER TESTING - HISTORY

- BAER testing began during 1991 (AHT)
- Other testing locations followed over the years
- Now some 9 test centres available
- 10231 Dalmatians tested 1992-2013

2

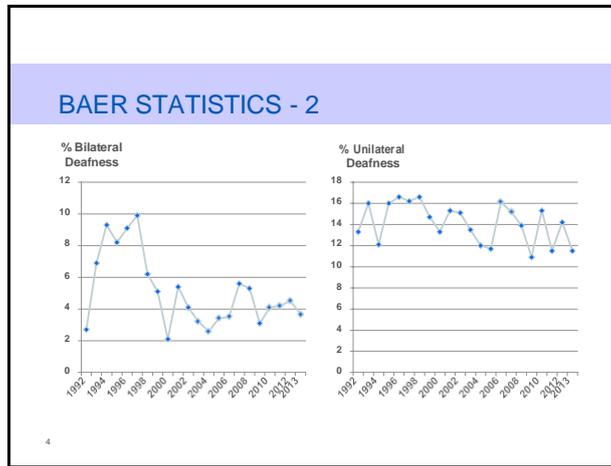
The availability of BAER testing in the UK was initially viewed with some caution and/or apprehension, and its uptake was slow to begin with. As confidence and acceptance improved in the early years, testing became the norm for most Club Members. Today they regard it as routine. The total number Dalmatians tested since 1991 actually approximates to the UK population of KC registered Dalmatians at any one time.

BAER STATISTICS - 1



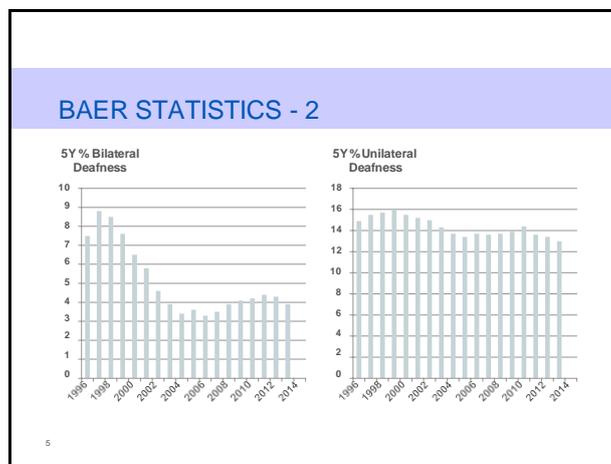
3

The graph on the left side shows the growth in the absolute number of Dalmatians tested each year. However, the progressive increase in the proportion of dogs tested, and the acceptance of BAER testing as an important health test requirement, is demonstrated more convincingly in the right hand graph. This shows the variation by year of the percentage of all registered Dalmatians which have been BAER tested, and illustrates that today approaching 40% of all registered Dalmatians are tested. This clearly represents more Dalmatians than those owned/bred by Breed Club Members, and it is encouraging to see that those outside the influence of Breed Clubs are beginning to accept the need for BAER screening.



Well documented scientific studies in both the USA and UK have clearly demonstrated that breeding only from bilaterally-hearing Dalmatians results in a decrease in the incidence of hearing deficiency in the puppies produced. For this reason, Breed Club members have adhered for many years now to the practice of breeding only from bilaterally-hearing parents. The key question is ‘Has this practice made any difference to the incidence of deafness in UK Dalmatians?’

The slide above plots separately the percentages of bilaterally- and unilaterally-deaf Dalmatians by year. The two graphs each suggest some level of decrease, though there is significant scatter between individual years. In some case, especially the early years when test numbers tested were relatively small, substantial scatter could be expected as 1 or 2 more or less bilaterally-deaf dogs would have a substantial effect on the percentage incidence. Even when higher annual test numbers are achieved, the absolute number is still prone to distortion by, for example, a single litter with a poor BAER outcome. Is it too subjective, therefore, to suggest that these data do indeed demonstrate a definite and positive decrease?



One way to minimise the effect of year on year scatter, and to enable a genuine trend to be seen more clearly is to take a so-called rolling average. In the graph above, this has been done by averaging the first five years’ percentages (1992-1996), and recording this as the rolling 5-year average for 1996. For the next year, the numbers for 1997 are added in, and those for 1992 removed, to obtain a new average for 1997; and so on to the current year.

This is not a manipulation of the statistics, but is simply a way of increasing the sample size, and eliminating the effects of transient variations. The result is very clear. There has been a significant decline in the incidence of bilateral deafness, in broad terms from about 8% to about 4%, **i.e. bilateral deafness has been halved**. This is a very substantial and commendable improvement.

The decrease in the incidence of unilateral deafness is less obvious, though there does appear to have been a definite reduction from the peak in early years of about 20%, and in absolute terms a decrease of about 3%. It must be remembered, also, that a unilaterally deaf Dalmatian is a hearing Dalmatian!

KC BAER SCHEME – WHY?

Why do we need one?

- Need published central record of results
- Must unequivocally link result to dog
- Must include ALL results
- Must be independent of owners/breeders
- Invaluable record for future use and research

6

At the present time, there is no independently maintained, reliably authentic, register of BAER test results. Without such a register, how can any purchaser have total confidence that the BAER test certificate handed to them with a Dalmatian puppy is the genuine test result for that puppy. How does the purchaser know whether or not he/she has fallen victim to an unscrupulous breeder who has simply photocopied a ‘good’ test certificate. Surely, we would be naïve to suggest that this deceit has never taken place in the past?

Even with an independently-maintained register, it is vital that there is an irrefutable and unequivocal association between a test certificate, the identity of the puppy to which it relates, and to its KC registration.

Accordingly, it is a prerequisite that any test scheme and register of results employs a protocol in order to ensure the authenticity and relevance of a BAER test certificate in relation to an individual puppy.

KC BAER SCHEME - STATUS

- Scheme given GC approval
- Protocol established
- IT systems in place
- Press release imminent
- Up and running thereafter

7

A KC Scheme for BAER testing has been under discussion for some years now, and achieved approval from the Kennel Club in 2013. Subsequently, a protocol for Scheme has been approved and is supported by the Breed Clubs. IT systems are being put in place to capture and record the test data, and it is anticipated that the Scheme will be up and running by the year-end.

KC BAER SCHEME - PROTOCOL

- Dogs must be KC registered and microchipped.
- Microchip of dog verified prior to testing
- Actual screening protocol determined by test centre
- Test certificate signed by veterinary surgeon
- Test centres send copies of all test certificates to KC
- Result added to registration record
- Results published in BRS

8

KC registration and microchip identification will be required before a test is undertaken. Although the actual BAER testing protocol will be a matter for the individual test centre, it will be a requirement that the microchip number for each puppy (or adult) presented for testing under the Scheme will be checked and recorded on the test certificate along with the registration details for the dog in question. This creates an association between the registration, the microchip number, and the test result for that individual Dalmatian, which cannot be subsequently changed. A copy of the test certificate is always sent directly to the KC which will record and publish the results in the Breed Records Supplement.

KC BAER SCHEME – THE FUTURE?

Current position:-

- Know hearing status of sire/dam
- Much more data available for ancestors
- ...but we can't access it! What would we do if we could?
- Sire and dam may be bilateral hearing, but....
-all the sire's siblings might have been deaf!
- Would we be less likely to use it at stud?
- What about the bitch from a similar situation?
- What use could we make of such info anyway, and how?
- Could we reduce deafness further?

9

It is ironic to some extent, that although responsible breeders only breed from bilaterally hearing parents, they have no means of knowing the hearing status of the siblings of the intended parents and other earlier ancestors (unless bred themselves, that is), even though multiple generations of ancestors will have likely been tested before.

When the question was posed to the audience at the Seminar 'Would you breed from a bilaterally-hearing dog or bitch, if you knew that all the siblings of either the dog or the bitch were bilaterally deaf?', the emphatic response was definite 'no'. The example might be an extreme one, but illustrates the fact that we would all like to take a broader account of hearing status in the wider ancestry of a proposed mating, but have no source of information with which to do so, and certainly we would be unable to utilise the information other than subjectively even if we had it.

So can we do anything? Without a formal Scheme of recording authentic and reliable test data, the answer would be at best very little, and in reality probably nothing! But with a Scheme as a foundation, read on.....

HEARING STATISTICS

Final thoughts:-

- 4% bilateral deafness means 1 deaf puppy every 3 litters (average)
- If we could reduce it further....
 - 3% means 1 deaf puppy every 4 litters
 - 2.5% means 1 deaf puppy every 5 litters
 - 2% means 1 deaf puppy every 6 litters

Which all leads onto:
ESTIMATED BREEDING VALUES

10

If we were able to reduce the incidence of bilateral deafness by further small amounts, what would be the impact?

Taking an average litter size as 8 (not unreasonable), the average incidence currently is 1 puppy in every 3 litters. The statistics in the above slide demonstrate that only small reductions are necessary to have a real impact in the ‘per litter’ incidence, which all responsible breeders would surely be delighted to achieve?

So how can we utilise to advantage the information which will be available to us from a KC BAER Scheme? The answer is by the use of **Estimated Breeding Values**.

[The subsequent presentation at the Seminar by Dr Tom Lewis addressed the principles and utilisation of Estimated Breeding Values (“EBVs”) in detail. In essence, the EBV concept provides a means for improving the prediction of the prevalence of a health condition in a litter of puppies, where the mode of inheritance involves more than a simple genetic mode of inheritance. The principle of EBV analysis takes account of the status of all ancestors of a proposed mating which have been tested for the condition in question, and not just the intended parents, in predicting the likely level of inheritance for the condition and the confidence factor for that result. Dr Lewis confirmed that EBVs were particularly pertinent to BAER testing and deafness in Dalmatians. He also expressed the view that, because it is the practice to screen whole litters of puppies, sufficient data could be compiled via the KC BAER Scheme such that EBVs could be applied beneficially to addressing deafness within just a few years].