The Advisory Council on the Welfare Issues of Dog Breeding

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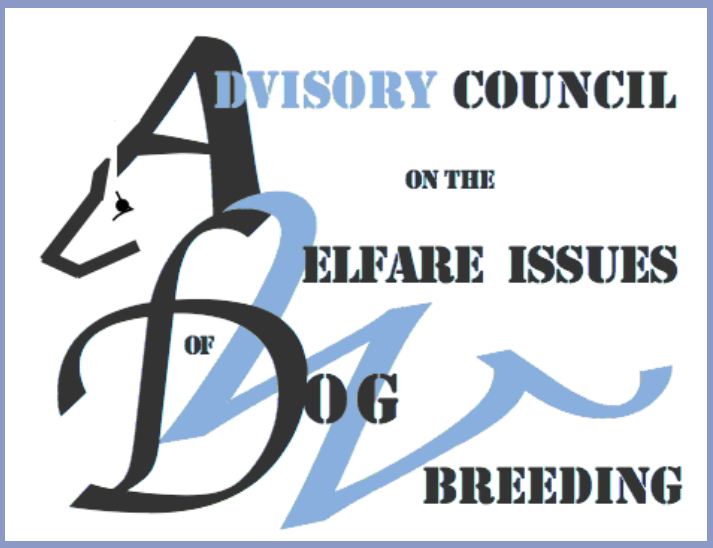

Summary of progress since the Bateson Report of 2010

A REPORT OF THE ADVISORY COUNCIL ON THE

WELFARE ISSUES OF DOG BREEDING: DECEMBER 2014

REPORT OF THE ADVISORY COUNCIL ON THE WELFARE ISSUES OF DOG BREEDING

Summary of progress since the Bateson Report of 2010

Chairman's Foreword

It is with mixed feelings that I write this introduction to the Advisory Council's Report on Progress against the recommendations of the Bateson Report (Independent Inquiry into Dog Breeding, 2010). In the four years since the Advisory Council was established we have addressed all the issues which Professor Sir Patrick Bateson raised for Council's attention and, with the support of other organisations and individuals committed to the welfare of dogs, we have made progress towards resolving some of the most serious health and welfare challenges facing dogs. It is, without doubt, a pleasure to be able to report this degree of progress and to note that, in many instances, those of good will towards dogs have united to deal with some immediate and serious problems. Supported by a most efficient secretary in Mrs Heather Peck, the wide ranging expertise and commitment of Council members, with assistance from the Expert Panel, and the generous financial contribution from our major patrons (Blue Cross, Dogs Trust, People's Dispensary for Sick Animals and Royal Society for the Prevention of Cruelty to Animals) ensured that we have contributed effectively and in collaboration with others, on a wide range of issues. These include priority welfare problems; dangerous dogs and 'status' dogs; permanent identification; the Puppy Contract produced by the Royal Society for the Prevention of Cruelty to Animals and British Veterinary Association-Animal Welfare Foundation (RSPCA/BVA-AWF); the Chartered Institute of Environmental Health's (CIEH) Model Licence Conditions and Guidance for Dog Breeding Establishments; modification of Kennel Club (KC) breed standards; problems associated with the pet travel scheme; and governmental matters including dog health and welfare and regulation and legislation. We have had less success in negotiating the complexities of agreeing a single breeding standard for all dogs that aligns with the Kennel Club's Assured Breeder Scheme (ABS), but have finally produced a document with few points of disagreement, none of them insuperable.

Sadly, progress in other areas has not been as swift or cooperation as active and united. You will see in the Report that some challenges highlighted by Professor Bateson have yet to be resolved; the most disappointing example being the lack of any response from Defra Ministers to the Council's recommendations on regulation. This has been particularly surprising, given the number of occasions when Ministers had stated they were looking forward to receiving the recommendations! Not only do we still await any commitment to replace the out-of-date regulations that govern the breeding of dogs with regulations fit for the 21st century; we have even seen proposals to dilute still further the inadequate regulations that we have at present. It is not possible to make progress on the worst aspects of irresponsible breeding without Defra support and Westminster government involvement, although the engagement of the devolved administrations is gratefully acknowledged.

All of us on Council continue to be distressed by the levels of pain, discomfort and shortened life spans suffered by some dogs and frustrated that so much of this pain is the direct result of human neglect, human choices and human ignorance. We repeatedly see television programmes which celebrate the extraordinary abilities of dogs to guide the blind, assist those with disabilities, detect cancers, warn of impending diabetic coma or epileptic fits, find drugs or explosives, support search and rescue teams and round up our livestock, to name but a few of the services they provide for people. Ever more popular programmes and articles report the dogs' extraordinary and unique ability to form close attachments with us, of considerable benefit to human mental and physical health and well-being. Yet still we fail to ensure even that the duty of care imposed by the Animal Welfare Act is reliably met in the breeding and sale of dogs. The message of this Report, in short, is that while much has been achieved, much still remains to be done. The challenges are considerable

and complex, ranging from a celebrity and commodity culture that encourages people to breed dogs for others to buy as fashion accessories rather than sentient beings, to the appalling health and welfare that can result from deliberate cruelty, neglectful breeding, ignorant buying, and the ill-advised selection of breeding pairs which results in high levels of inherited disease or extremes of conformation that are directly responsible for painful or disabling conditions. Only if all who care about dogs can place the dogs' well-being higher than individual objectives, will we have a real capability to tackle the problems that remain and deliver significant change.

Finally, I would like to take this opportunity to thank the members of Council for their unstinting hard work, support and dedication to the welfare of dogs. The cause of dog welfare owes them more than I can say.

Chairman, Advisory Council on the Welfare Issues of Dog Breeding, 2010-2014

Members of Council 2010-2014

Mrs Lesley Bloomfield

Dr Rachel Casey

Dr Lisa Collins

Professor Sheila Crispin

Mr Chris Laurence

Mrs Lisa McCaulder

Dr Cathryn Mellersh

Mr Mike Radford

Dr Clare Rusbridge

Dr David Sargan

Introduction

1. The Advisory Council on the Welfare Issues of Dog Breeding (the Advisory Council or Council) completed three full years of operation in December 2013. The Council was always envisaged to be a time-limited organisation as funding was for a three year period, although through the exercise of stringent economy and very considerable *pro bono* work from Council members, the Council succeeded in stretching those three years of funding over more than four years of operation. However, the top priority now must be the development of a shared strategy with all stakeholders of good will to dog welfare, to ensure that the specific projects and reports of the Council are taken forward by the relevant bodies and that collaborative work continues in the absence of a formal independent Advisory Council.
2. In considering which projects should be a high priority for completion by the Council and others before the Council's formal activities are wound up, Council members were of the view that a report on progress made against the recommendations of Professor Sir Patrick Bateson in his 2010 report (Independent Inquiry into Dog Breeding) would be a good way of reviewing the work which has been carried out by the Council and many others over the last four years, the impact on animal welfare that has been achieved, and identifying the work that remains to be done.
3. This Report is therefore structured around Professor Bateson's 14 recommendations and while it reports the work of the Advisory Council, it also seeks to report on all advances which are relevant to these recommendations.

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SYNOPSIS

Recommendation 1 *A non-statutory* ***Advisory Council on Dog Breeding*** *should be established. The key role of the Council should be to develop evidence-based breeding strategies that address the issues of poor conformation, inherited disease and inbreeding as appropriate to the specific breed and to provide advice on the priorities for research and development in these areas. I recommend that the Advisory Council members and Chairman should be appointed by open competition according to Nolan Principles.* ***Defra*** *should manage the selection process, drawing appropriately upon the advice of the devolved authorities and experts. Members should be selected on the basis of their personal expertise and not with regard to any personal affiliation or membership.*

Advisory Council response

(i) The key role envisaged for the Advisory Council has been followed, as outlined in this report;

(ii) The Advisory Council was appointed by open competition according to Nolan Principles;

(iii) DEFRA was not involved in the process for the selection of the Chairman and Members of the Advisory Council, but welcomed the Advisory Council's formation.

Recommendation 2 *High priority should be given to the creation of a computer-based system for the collection of anonymised diagnoses from veterinary surgeries in order to provide statistically significant prevalence data for each breed. This should build upon the work already started by the* ***Royal Veterinary College****. It is important that this scheme is fully supported by the* ***Royal College of Veterinary Surgeons****. In a pilot scheme, priority should be given to collecting data with respect to the conditions creating the greatest welfare challenges in terms of pain, impact on quality of life, capacity for correction, and early age of onset. The data collected should relate both to the incidence of inherited disease and to the incidence of veterinary procedures necessary to correct faults due to selection for extreme morphologies (e.g. Caesarean sections, corrections for entropion, soft palate resections, etc).*

Advisory Council response

(i) This is being achieved in collaboration with many other stakeholders and RCVS Knowledge, previously the RCVS Charitable Trust, supports data collection projects of this type as part of its commitment to evidence-based veterinary medicine. The challenge is to set robust parameters and build systems that can reconcile prevalence data from multiple sources;

(ii) The Canine Health Schemes, a partnership between the British Veterinary Association and Kennel Club (and International Sheep Dog Society for the Eye Scheme), have been updated and expanded to improve data collection and analysis;

(iii) The Advisory Council is setting up a Trust Fund to support research connected with the collection of canine prevalence data, particularly in relation to those conditions with the greatest impact on quality of life;

(iv) Reporting on veterinary procedures related to extreme morphologies, which involves the Kennel Club, Royal College of Veterinary Surgeons and British Veterinary Association, has been less successful than anticipated because so few reports are received.

Recommendation 3 *Revisions of Breed Standards should recognise the need to avoid the selection for extreme morphologies that can damage the health and welfare of the dog. When possible, revisions should involve guidance from the Advisory Council on Dog Breeding. Where a welfare problem already exists within a breed, the breed standard should be amended specifically to encourage the selection for morphologies that will improve the welfare status of the breed. In these instances the breed standard may need to be more precise, either by aid of diagrams or quantitative ratios, in order to encourage the necessary changes.*

Advisory Council response

(i) Council members have contributed to various Kennel Club initiatives aimed at revising breed standards and improving breed welfare;

(ii) The Advisory Council has reported on priority welfare problems that have serious implications for the dog's quality of life, not just those associated with extreme morphologies. Council has made recommendations on how to address these problems, including the research needed to supply evidence-based solutions (Appendices 1 and 2);

(iii) Other bodies and individuals are working, often in conjunction with Council members, on changing morphologies with health and welfare implications; for example, brachycephaly and syringomyelia/chiari malformation;

(iv) A joint working party to address extremes of conformation (funded by the RSPCA) has been established.

Recommendation 4 *I have recommended to the* ***Kennel Club*** *that it upgrades its Accredited Breeder Scheme promptly. If it is unable to do so and no other body steps forward to supply an appropriately robust and UKAS accredited scheme, a new scheme should be implemented under the auspices of the Advisory Council on Dog Breeding. The organisers of any accredited breeder scheme should apply for and obtain UKAS accreditation. The minimum conditions for such a scheme should be that:*

a. All pre-mating tests for inherited disease appropriate to the breed or breeds are undertaken on both parents.

b. No mating takes place if the tests indicate that it would be inadvisable in the sense that it is likely to produce welfare problems in the offspring and/or is inadvisable in the context of a relevant breeding strategy (see also 2).

c. Any prospective purchaser is able to view the puppies with their mother.

d. Every puppy is identified by microchip prior to sale

e. All pre-sale tests on the puppy which are appropriate to the breed have been carried out.

f. The scheme establishes and requires clear, written standards of management with regard to the housing, health, exercising and socialising of all dogs on the premises managed by the registered breeder, including establishing minimum staffing levels appropriate to the numbers of dogs involved.

g. All relevant documentation connected with the puppy including, inter alia, advice on feeding and care, registration documents, details of vaccinations etc are handed over to the purchaser at the time of sale. When an appropriate contract is available this should be signed by both parties.

h. All assured breeders are inspected by duly appointed and trained scheme inspectors against the written standard, either before or shortly after registration with the assurance scheme; and regularly thereafter.

i. Non-compliance with the standards of the scheme results in de-registration

j. If accolades are to be awarded to any breeder under an accredited scheme, they should clearly and solely relate to the provision of higher welfare standards.

Advisory Council response

These recommendations were largely aimed at the Kennel Club and the Kennel Club has now achieved a UKAS accredited Assured Breeder Scheme. The Advisory Council's involvement has been through:

(i) Membership of the Kennel Club Dog Health Group (two Council members) and sub-groups (three Council members – Breed Standards and Conformation, Genetics and Health Screening and Assured Breeder Scheme);

(ii) Production of an Advisory Council Standard for Breeding Dogs (Appendix 3) and participating in a joint working party aimed at achieving a single standard based on the Kennel Club's Assured Breeder Scheme (Appendix 4) and the Council's Standard;

(iii) The Advisory Council joined with other organisations to support the joint BVA-AWF and RSPCA Puppy Contract and the Pup Aid campaign;

(iv) The Advisory Council worked as part of the Microchipping Alliance to ensure that all dogs are permanently identified, by microchip, before they leave the breeder.

Recommendation 5 *Working with the* ***profession*** *as a whole, the* ***RCVS*** *and the* ***BVA*** *should lead a shift in emphasis towards preventative veterinary medicine rather than simply focus on the correction of problems after they have occurred.*

Advisory Council response

(i) The Advisory Council collaborates on this, but the recommendation is aimed at the veterinary profession, the RCVS and BVA; the British Small Animal Veterinary Association (BSAVA) is also involved, as are various European bodies, in promoting this shift of emphasis;

(ii) The Advisory Council has developed and piloted a format and guidance for veterinary surgeons on puppy health checks, supported by the RCVS, BVA, and BSAVA (Appendix 5).

Recommendation 6 *When inspecting the premises of breeders that require licences,* ***Local Authorities*** *should address all welfare issues covered by the Animal Welfare Act 2006, especially those relating to dog behaviour. In issuing a licence Local Authorities should specify the staffing levels necessary to ensure appropriate health and welfare, including exercise of parents and socialisation of the puppies. To facilitate this, licensed premises should be required to maintain records of staffing and those records should be available for inspection. Breeders' records should be inspected to ensure that breed-appropriate pre-mating tests and screening programmes have been carried out with regard to both parents and that decisions to breed are appropriate in the light of the results.*

Advisory Council response

(i) The Advisory Council has worked with Local Authorities, both directly and indirectly, in conjunction with other welfare bodies;

(ii) Council members were part of the stakeholder group that produced the Chartered Institute for Environmental Health Model Licence Conditions and Guidance for Dog Boarding Establishments;

(iii) A late amendment to the Government's Deregulation Bill (Appendix 6) which sought to remove the need for keeping records in a prescribed form runs counter to this recommendation.

Recommendation 7 *Irrespective of whether they are members of an Accredited Breeder scheme, all* ***breeders*** *should have their puppies microchipped before they are sold. Prospective purchasers should expect that this has been done before buying a puppy.*

Advisory Council response

(i) The Advisory Committee has worked as part of the Microchipping Alliance and prior to that with the Dangerous Dogs Act Study Group, to ensure that microchipping is compulsory in all dogs and that the responsibility rests with breeders. The requirement to microchip a dog before it is sold aims to identify the breeder as the first keeper.

Recommendation 8 *As soon as* ***Parliamentary*** *time permits, Regulations should be made under the Animal Welfare Act 2006 in order to:*

a. Require that all puppies should be indelibly identified, by implantation of microchip or such other equivalent system as may be developed, prior to sale; and that the ID number of the microchip or equivalent should be recorded on the contract of sale, all relevant health test certificates and registration documents and a central data base.

b. Create an obligation on any person breeding dogs to have regard to the health and welfare of both the parents and the offspring of the mating.

c. Require that any body laying down breed standards must have regard to the health and welfare of the dogs and the need to avoid breed specific health problems; and that in exercising such a power, the body could be regarded as exercising a power of a public nature and thus be susceptible to judicial review.

d. Create such offences with regard to the above as seem appropriate.

And

Recommendation 10 *When* ***Parliamentary*** *time permits, regulations should be introduced to replace the various Breeding and Sales of Dogs Acts. In drafting these regulations, consideration should be given to amending the definition of premises that require licensing in order to simplify and make more effective the enforcement of licensing standards and compliance with the provisions of the Animal Welfare Acts. Enforcement authorities should be enabled to carry out inspections on the basis of a risk assessment and to take account of achievement of accredited status under an appropriately enforced and audited accreditation scheme. In order both to facilitate effective enforcement and to encourage a responsible approach to purchasing by the general public, enforcement authorities should be required to maintain a list of licensed premises which is accessible on-line by the public. Consideration should also be given to creating a centralised database of persons who have been convicted or cautioned under animal welfare legislation. The Dangerous Dogs Act should be amended to apply to all dogs that have been shown to be dangerous rather than to specified breeds and should address the problem of dogs being bred and reared specifically as weapons or for fighting.*

Advisory Council response

(i) These recommendations were aimed at Governments. On 1 September 2013 the Advisory Council delivered to Governments (including the Governments of the UK and Scotland and the Assemblies of Northern Ireland and Wales) its Recommendations on Legislation governing the breeding, supply, sale and advertising for sale of dogs (Appendix 7).

Recommendation 9 Defra *should implement a statutory Code of Practice on the Breeding of Dogs under Section 14 of the Act. The Code should encompass such issues as:*

a. The health and welfare of the parent dogs.

b. The appropriate screening and testing of parents for breed specific disorders, as laid down in the relevant breeding strategy for the breed (or breeds) concerned.

c. In selection of parents, due consideration being given to compliance with such elements of a breed standard as are intended to avoid extremes of conformation that create welfare problems.

d. The health, welfare and appropriate socialisation of litters of puppies, in order to fit them for their future function.

e. Mechanisms for the sale of the puppies.

f. When UKAS accredited quality assurance schemes address all the issues covered by the code, the Code should recommend membership of such an accreditation scheme.

Advisory Council response

(i) This recommendation was aimed at Defra, but has not been addressed by Defra;

(ii) The Advisory Council has offered to draft a Code of Practice based on its published Standard for Breeding Dogs, but no response has been received from Defra.

Recommendation 11 *The* ***British Veterinary Association*** *should compile, and provide to Local Authorities, a list of veterinary practitioners willing to carry out and/or support inspections of licensed breeding premises.*

Advisory Council response

(i) The Advisory Council invited BVA to comment.

Recommendation 12 *Complementing all existing schemes, a public awareness and education* ***campaign*** *should be designed by* ***expert practitioners****, in order to persuade members of the general dog-buying public to change their behaviour in specific key respects and to provide readily comprehensible information on what questions to ask and what to look for when buying a dog. This should be supported and run by as many as possible of the* ***dog and animal welfare organisations****, acting jointly and in unanimity.*

Advisory Council response

(i) Clearly the Advisory Council did not have the capacity, or necessity, to organise a public awareness and education campaign, but it has encouraged other welfare bodies, including charities, to work together to achieve this, perhaps in conjunction with commercial organisations;

(ii) The Advisory Council delivered and launched a web-based tool, complementing those used by other stakeholders, supporting decisions on whether and how to buy a dog, and which breed is best suited to a prospective owner's lifestyle.

Recommendation 13 *When robust and audited accreditation scheme(s) are available, the buying public should be pointed with confidence towards the* ***accredited breeders*** *as offering a genuinely higher standard of health and welfare to the animals in their care and thus towards a fit, healthy and appropriately socialised puppy.*

Advisory Council response

(i) No such scheme exists for all dog breeders, although the Kennel Club Assured Breeder Scheme has made significant improvements for dogs registered with the Kennel Club.

(ii) Educating the buying public is clearly essential.

Recommendation 14 *The report by APGAW (2009) was published in November 2009. As I have already noted, their brief was narrower than mine, but where the focus of the two inquiries overlap, the recommendations should be brought together. I welcome the suggestion of the RSPCA that a meeting of the relevant parties should be convened as soon as possible after the publication of the present report.*

Advisory Council response

(i) The recommendations were, summarised, compared and reconciled by the Advisory Council Secretary and brought together as suggested.

DETAILED REPORT ON PROGRESS AGAINST THE RECOMMENDATIONS

Recommendation 1 *A non-statutory* ***Advisory Council on Dog Breeding*** *should be established. The key role of the Council should be to develop evidence-based breeding strategies that address the issues of poor conformation, inherited disease and inbreeding as appropriate to the specific breed and to provide advice on the priorities for research and development in these areas. I recommend that the Advisory Council members and Chairman should be appointed by open competition according to Nolan Principles.* ***Defra*** *should manage the selection process, drawing appropriately upon the advice of the devolved authorities and experts. Members should be selected on the basis of their personal expertise and not with regard to any personal affiliation or membership.*

In September 2010 the **Advisory Council** was incorporated as a not-for-profit company, limited by guarantee without share capital. Its objects, set by the Dog Welfare Review Board, as recorded at Companies House, are:

> *"to provide independent, expert advice and make recommendations on methods and priorities for improving the welfare issues of dog breeding with particular regard to*
>
> - *Surveillance, research and development*
> - *Breeding strategies*
> - *Legislation and regulation*
> - *Education and publicity*
>
> *In furtherance of its purpose but not otherwise, and subject to the relevant Rules of Procedure, the Council shall, within the UK, provide advice to governments and other parties as appropriate regarding improving the welfare issues of dog breeding."*

The Chairman and all the members of the Council were selected on merit through an open competition. Defra declined to carry out the selection process, so it was conducted in accordance with Appointment Commission procedures with the participation of an independent Chairman and Member and under the supervision of a Fellow of the Institute of Personnel and Development. Members undertake to carry out their Council duties in accordance with the Nolan principles of public accountability and regularly update a public log of any potential conflicts of interest.

The Council held its first meeting in December 2010 and has met on six occasions in each of the subsequent four years. Each year one meeting is held in public and, resources permitting, the minutes of meetings are published on the Council website.

Following its formation, the Advisory Council reviewed the activities of all the external stakeholders under the headings above (surveillance, research and development; breeding strategies; legislation and regulation; education and publicity). It was apparent that much was being accomplished, but with considerable duplication and whilst greater collaboration would undoubtedly benefit dog health and welfare, competition, and sometimes disagreements, between various bodies and organisations mitigated against this approach. The information gathered from this exercise did, however, indicate that collaboration could be improved and that better resourced welfare bodies and commercial organisations should lead on education and publicity campaigns rather than the Advisory Council.

The BBC One television programme *'Pedigree Dogs Exposed'* (2008) resulted in a plethora of activities in the UK and abroad, which highlighted and addressed the health and welfare issues in dogs, particularly pedigree dogs, with rather more urgency than previously. Council members have been involved in many of these through, for example, research, congresses, workshops, seminars, peer reviewed publications, the popular press and media appearances. However, there is still a concern that some breeders continue to be reluctant to recognise the health and welfare issues that can arise through poor breeding practices and the situation has become even more complicated by extensive cross breeding to produce so-called *'designer dogs',* in part exploiting the public reaction against pedigree dogs which followed *'Pedigree Dogs Exposed.'*

Advisory Council members have been active participants in developing evidence-based strategies both individually and collectively. As one example, staff from the Kennel Club Genetics Centre at the Animal Health Trust, led by Council member Dr Cathryn Mellersh, together with collaborating clinicians, are investigating the genetic basis of a wide range of inherited ocular and neurological disorders in dogs, with the aim of developing DNA tools that breeders can use to reduce the prevalence of these disorders in breeds at risk. Diseases under investigation include idiopathic epilepsy in the Border Collie and the Italian Spinone and glaucoma in the Flat Coated Retriever, Welsh Springer Spaniel, Dandie Dinmont Terrier, Basset Hound, Leonberger, Golden Retriever and the Petit Basset Griffon Vendeen. Also under investigation are a number of additional inherited neurological disorders including sensory neuropathy in the Border Collie and a paroxysmal movement disorder with the lay name epileptoid cramping syndrome in the Norwich terrier. These studies are funded by the Kennel Club Charitable Trust, PetPlan Charitable Trust, Dogs Trust, The Waltham Foundation, various Breed Clubs and donations from individuals.
For further details see: www.aht.org.uk

University employees who are members of Council (Dr Rachel Casey, Dr Lisa Collins, Mr Mike Radford, Dr Clare Rusbridge and Dr David Sargan) are also actively involved in work of relevance to the Bateson recommendations on canine health and welfare. For further details see: www.bris.ac.uk; www.lincoln.ac.uk; www.abdn.ac.uk; www.surrey.ac.uk; www.vet.cam.ac.uk

Reports and recommendations provided by the Advisory Council are listed against the relevant recommendations of Professor Sir Patrick Bateson's Independent Inquiry into Dog Breeding.

Recommendation 2 *High priority should be given to the creation of a computer-based system for the collection of anonymised diagnoses from veterinary surgeries in order to provide statistically significant prevalence data for each breed. This should build upon the work already started by the Royal Veterinary College. It is important that this scheme is fully supported by the Royal College of Veterinary Surgeons. In a pilot scheme, priority should be given to collecting data with respect to the conditions creating the greatest welfare challenges in terms of pain, impact on quality of life, capacity for correction, and early age of onset. The data collected should relate both to the incidence of inherited disease and to the incidence of veterinary procedures necessary to correct faults due to selection for extreme morphologies (e.g. Caesarean sections, corrections for entropion, soft palate resections, etc).*

Current state of breed specific prevalence studies of canine diseases in the UK

VetCompass http://www.rvc.ac.uk/vetcompass (Royal Veterinary College, with University of Sydney: Brodbelt, Church, O'Neil, McGreevy and others)

VetCompass is a renaming of the previous VEctAR project that collects clinical data directly from first opinion practices using consultation records. Currently (November 2014) VetCompass holds data on 811,140 dogs recorded as patients in 299 clinics that are distributed representatively across the UK. Veterinary surgeons record each episode of care (computer logged consult notes are made available directly from practice) and are encouraged to use VeNom (Veterinary Nomenclature) coded terms. Records are searched for text strings and by coding to identify disorders of interest. To date eleven peer-reviewed publications have explored prevalence and risk factor studies in dogs and cats, although data on all veterinary species are collected.

Achievements have been considerable. A national network of veterinary practices has been set up (see map and comments below). Dogs in the top hundred breeds have been counted, and the annual birth rates of pups presenting at veterinary practices also established, allowing future demographic problems to be anticipated. Age at death and causes of death have been examined for over 5000 confirmed canine deaths, the former showing good agreement with previous surveys based on questionnaires, small breed

surveys or referral practices. Causes of death were not yet looked at in a breed specific manner as this initial study was too small. In a sample of nearly 4000 randomly selected dogs 430 disorder types have been recorded and the top twenty reasons for care episodes established. These included infectious diseases, problems with traumatic causes and disorders with genetic or complex causation. The survey confirmed the very wide spectrum of diseases seen across different breeds. A number of disorders have been studied in greater detail, including diabetes, kidney disease, epilepsy, cruciate disease and mast cell tumour. Other studies are in press or in progress.

Challenges to extending these data collection methods have included developing word search strategies that identify all consults addressing a given disease (allowing for differences in terminology and simple misspellings). This has led to an emphasis in VetCompass on developing computerised search tools capable of dealing with all possible spellings for each disorder studied, and also to manual curation and relatively small sample sizes being used in the early phase of the project. Not all welfare problems caused by conformation are well recognised by veterinary surgeons. For example, the level of severity at which Brachycephalic Airway Obstruction Syndrome (BOAS) is considered a disease problem but is interpreted very differently by different veterinary surgeons. The reliability of the owner/veterinary surgeon identification of breed is an issue shared with all other studies based on non-Kennel Club registered dogs, although microchip details are increasingly used to track dogs irrespective of any registration body. Finally, VetCompass works through providing software links for direct downloading from central servers at practice management systems. This relies on compatibility with the practice management systems' software and may have limited participation by some practices to date.

Funders: RSPCA, Kennel Club Charitable Trust, Dogs Trust, Pet Plan Charitable Trust.

SAVSNET (Small Animal Veterinary Surveillance Network) **http://www.savsnet.co.uk/** (University of Liverpool with BSAVA: Radford, Noble, Gaskell, Dawson and others).

SAVSNET Ltd is a charity dedicated to advancing research and education into pet animal diseases and promoting understanding of animal welfare and the relationship between animal and human disease. As with VetCompass, SAVSNET uses data collection from primary practice cases as its data source, but has been more focused on real time surveillance than on prevalence. It uses both geographical surveillance (post code of sample submission) to monitor diseases which are tested for at veterinary diagnostic laboratories across the UK and near-real-time (within 24 hours), practice-based surveillance where participating veterinary surgeons record information at the end of each consultation. Much of the work is based on very short simple choice questionnaires embedded in practice software. Some work is also based on free text responses to these questionnaires. Reported veterinary outputs have included work on infectious disease for cat and rabbit as well as dog. Focuses have been on gastrointestinal disease, pruritis, respiratory disease and the approach is on disease management as much as prevalence. In common with VetCompass, the SAVSNET team has also been working on text classifiers, and disease classification by computer from text identifiers is a clear problem for militating against scale-up to very large un-curated analyses for all workers in the area. Currently the practice network is considerably smaller than that monitored by VetCompass. During the period September 2012 to February 2014 some 89,277 consultations were collected for demographic analysis and 59,261 (66%) of these were in dogs. The majority of canine consultations (6,660) were in dogs of one year of age or less.

Funders: BSAVA, Wellcome Trust, BBSRC.

Other laboratory and clinic based studies: Several studies have been published using laboratory reports of single conditions on UK dogs to attempt to establish breed, age and gender prevalence. In the last few years multi-breed studies include a large study of uroliths of all types, and studies of hepatitis, pancreatitis, mast cell tumours and some other cancers, pyometra, inflammatory bowel disease, cruciate ligament rupture, as well as single breed prevalence studies of dilated cardiomyopathy, syringomyelia, and others. Unfortunately all these studies suffer from the lack of a firm basis for sizing the control population. In order to assess representation of each breed in the population most use comparison with the full range of cases admitted to the institution or submitted to the laboratory, or use Kennel Club registration statistics, or in at least one case insurance data. Each of these has uncorrected biases in its selection from the whole population of dogs in the UK.

Insurance based studies: Worldwide, and particularly in Scandinavia where the majority of dogs are insured, these studies have proved useful. A small number UK companies are now prepared to release anonymised data, but there are several problems with interpretation and use of this data, which mean that not much work has been funded. First it is stratified towards pedigree and designer breed animals, and in particular, by the lack of older animals which are more expensive or even impossible to insure. Second, insurance companies tend to work with a simplified coding system that means that only some questions can be well answered. The problems with terminology mentioned above also apply. However, for large surveys the classification work has usually already been performed to the company's satisfaction, and this makes insurance data useful for rapid "rough and ready" data collection or for work with numerically small (largely pedigree registered) breeds where a large sample of the total dog population needs to be found in the database.

Breed Health Surveys: Many breed clubs have recently run, or are now running, health surveys. These are being encouraged by the Kennel Club which has offered some assistance with survey design, but more assistance is needed with processing and distributing the data. The major weaknesses of the surveys are that design has not been standardised and that the results rely on the compliance, fallible memories and sometimes incomplete knowledge of breeders, and this can lead to several sorts of distortion. Nonetheless processing and compilation of these surveys may well offer the most complete source of breed based health data for pedigree dogs.

Overall, the rate of accumulation of breed specific data and the accuracy of estimates of breed numbers are now much higher than they were four years ago. But difficulties remain with the correct processing and interpretation of that data and the size of the task means that it will need to continue and be funded for several more years.

Kennel Club: A Bio-Acquisition Research Collaboration has been created by the Kennel Club to enable researchers and clinicians to work more effectively together. Other established initiatives, notably the Kennel Club's support for the Genetics Centre and Cancer Centre at the Animal Health Trust, the strengthening of its internal scientific group, the funding of research projects through the KC Charitable Trust, including a recent major collaboration with the VetCompass project at the RVC, and its involvement with the Canine Health Schemes, have all improved the potential for prospective data collection.

Canine Health Schemes: The Canine Health Schemes enable breeders to screen their dogs for a range of inherited diseases so they can make informed decisions as to whether those dogs should be included in breeding programmes. The Canine Health Schemes are in the process of being updated to make greater use of modern information technology. The British Veterinary Association/Kennel Club/International Sheep Dog Society (BVA/KV/ISDS) Eye Scheme is used as an example of how the schemes can contribute to data collection and analysis and provide comprehensive information to owners and breeders about inherited and breed-related ocular problems and their impact on health and welfare.

Input sources from the BVA/KC/ISDS Eye Scheme include information from certificates of eye examination and litter screening forms. In addition to publishing examination results from the breeds listed under Schedule A (those with known inherited eye disease), data is collected on the other non-Schedule A eye and adnexal (eyelids, lacrimal system, orbit and para-orbital region) anomalies and abnormalities that have been identified in all the dogs examined under the Eye Scheme. The aim is to ensure that all clinical information obtained from examination of each breed is summarised and published on the Internet in anonymised form. To assist researchers and clinicians further in the collection of valuable data, veterinary ophthalmologists are encouraged to collect DNA samples (cheek swabs), from normal dogs and those with clinical signs of inherited and potentially inherited ocular disease, after obtaining the owner's permission to do so.

Breed specific projects include clinical and genetic investigations of glaucoma in a number of breeds (see elsewhere), a review of progressive retinal atrophy (PRA) and a survey of distichiasis in dachshunds with the aim of establishing its prevalence, clinical significance and possible mode of inheritance.

It is axiomatic that for the Eye Scheme to generate useful data all dogs should undergo relevant tests (eye examination +/- laboratory examination) before they are used for breeding and that such dogs, as a minimum, should undergo a further eye examination when over eight years of age in order to generate longitudinal data. In practice, many breeds undergo annual re-examination during their breeding life, especially those belonging to Assured Breeders, but not when they are older and no longer being used for breeding. It is clear that examination of all dogs, before they are bred from, throughout their breeding life and when they are over eight years of age, would provide a much more complete picture of inherited and breed-related ocular problems in dogs.

The **Royal College of Veterinary Surgeons** (RCVS) is supportive of existing data collection projects, notably VetCompass and SAVSNET. RCVS Knowledge, formerly the RCVS Trust, states its activity to be that of a facilitator of evidence-based veterinary medicine projects at an international level and recognises that it can encourage evidence-gathering, but is not in a position to direct and manage data gathering exercises.

Future Work on Prevalence Data: The Advisory Council is establishing a Trust fund to support research connected with the health and welfare of dogs, particularly those with the greatest impact on the quality of life. Trustees for the Fund will be drawn from among the Council.

The **reporting of veterinary procedures** necessary to correct faults due to selection for extreme morphologies is under review, as the existing arrangement is not working well; in part because of the veterinary profession's concerns about client confidentiality, although the report form needs to be improved and the submission rate is very low. The RCVS, BVA and Kennel Club are likely to be involved in producing a more effective system and it might be sensible for any new arrangement to be run initially as a pilot project.

Recommendation 3 *Revisions of Breed Standards should recognise the need to avoid the selection for extreme morphologies that can damage the health and welfare of the dog. When possible, revisions should involve guidance from the Advisory Council on Dog Breeding. Where a welfare problem already exists within a breed, the breed standard should be amended specifically to encourage the selection for morphologies that will improve the welfare status of the breed. In these instances the breed standard may need to be more precise, either by aid of diagrams or quantitative ratios, in order to encourage the necessary changes.*

In 2009, the Kennel Club changed some Breed Standards and introduced Breed Watch (http://www.thekennelclub.org.uk/media/341571/flow_diagram_-how_does_breedwatch_work.pdfas) '*an early warning system to identify particular areas of concern for individual breeds'*. It also initiated a Category Three (High Profile) list of 12 (from an original 15) breeds, *"the primary purpose of which is to enable anyone involved in the world of dogs, but in particular dog show Judges, to find out about any breed specific conformational issues which may lead to health problems".* http://www.thekennelclub.org.uk/health/health-and-welfare-for-show-dogs/category-three-breeds/.

The Advisory Council has collaborated with the Kennel Club through the KC Dog Health Group and Dog Health Sub-Groups and involvement in meetings, seminars and workshops aimed at, for example, breeders, breed health co-ordinators, dog show judges and veterinary surgeons;

With regard to this recommendation the Kennel Club has responded:

> *"The Breed Standards describe the typical look, characteristics and temperament of a breed, and are subject to continual monitoring and review. In 2009 there was a comprehensive review, conducted in conjunction with a large body of experts, including veterinary surgeons, to ensure that they encourage the breeding of healthy dogs. As part of this review every Breed Standard had an opening paragraph added which makes it explicitly clear that the process of exaggerating features because they are thought to look good, when this at the expense of the dog's health, is not in any way acceptable."*

The Council has published two sets of assessments of and recommendations for addressing health and welfare priorities. After discussion within and outside Council it was agreed that the welfare priorities must extend beyond extreme morphologies and include problems, such as idiopathic epilepsy, that have a serious impact on the dog's quality of life and also that of the owner.

The first set was published in May 2012:

Ocular problems linked to head conformation,
Breathing difficulty linked to head conformation,
Syringomyelia and Chiari-like malformation,
Idiopathic Epilepsy,
Heart disease with a known or suspected inherited basis,
Breed-related and inherited skin conditions,
Limb defects (including hip dysplasia and elbow dysplasia);

And the second set in April 2014:

Glaucoma,
Inherited neurological disease,
Breed specific cancers,
Hypothyroidism and other auto-immune disorders with a breed-related or inherited basis.

These reports are reproduced in Appendices 1 and 2 respectively.

Several of the welfare priorities identified by the Council are under investigation by geneticists working in the Kennel Club Genetics Centre (KCGC) at the Animal Health Trust that is led by Dr Cathryn Mellersh The Kennel Club contributed £1.2 million to the running of the KCGC from 2009 – 2013 and has agreed to provide a further £1.6 million to support research activities from 2014 – 2018.

In 2014, the Advisory Council established a Working Group, funded by the RSPCA, to address the welfare problems arising from extremes of conformation in all types of dog.

Recommendation 4 *I have recommended to the Kennel Club that it upgrades its Accredited Breeder Scheme promptly. If it is unable to do so and no other body steps forward to supply an appropriately robust and UKAS accredited scheme, a new scheme should be implemented under the auspices of the Advisory Council on Dog Breeding. The organisers of any accredited breeder scheme should apply for and obtain UKAS accreditation. The minimum conditions for such a scheme should be that:*

a. All pre-mating tests for inherited disease appropriate to the breed or breeds are undertaken on both parents.

b. No mating takes place if the tests indicate that it would be inadvisable in the sense that it is likely to produce welfare problems in the offspring and/or is inadvisable in the context of a relevant breeding strategy (see also 2).

c. Any prospective purchaser is able to view the puppies with their mother.

d. Every puppy is identified by microchip prior to sale.

e. All pre-sale tests on the puppy which are appropriate to the breed have been carried out.

f. The scheme establishes and requires clear, written standards of management with regard to the housing, health, exercising and socialising of all dogs on the premises managed by the registered breeder, including establishing minimum staffing levels appropriate to the numbers of dogs involved.

g. All relevant documentation connected with the puppy including, inter alia, advice on feeding and care, registration documents, details of vaccinations etc are handed over to the purchaser at the time of sale. When an appropriate contract is available this should be signed by both parties.

h. All assured breeders are inspected by duly appointed and trained scheme inspectors against the written standard, either before or shortly after registration with the assurance scheme; and regularly thereafter.

i. Non-compliance with the standards of the scheme results in de-registration.
j. If accolades are to be awarded to any breeder under an accredited scheme, they should clearly and solely relate to the provision of higher welfare standards.

Many of these recommendations have been met by the Kennel Club Assured Breeder Scheme, but recommendation j has not been adopted; this is disappointing given that the Council believes that assessment of higher welfare standards under the ABS is an important and achievable aim. The Kennel Club has commented;

> *"The Kennel Club Assured Breeder Scheme currently contains, not within the scheme standard but as an adjunct, accolades which are designed as an aid to assist puppy buyers in selecting a breeder that is appropriate for their particular requirements and situation. These relate to the experience, knowledge and expertise of the individual breeder and not the dogs. It is not considered helpful to remove what is simply a useful additional guide for puppy buyers."*

The Council agrees with the Bateson recommendation that any accredited breeding scheme offering accolade classification relating solely to membership should be based purely on sound health and welfare practice, regardless of the activity in which that member may be involved. Membership of the KC ABS is member/person based not 'kennel based'. Accolades are currently based on a) membership of a Breed Club b) number of litters bred c) number of dogs in the Stud Book d) special recommendation by Breed Clubs for those members who have over many years demonstrated long term commitment and high standards of breeding practice.

After lengthy consultation with veterinary and genetic experts and dog breeders worldwide the Advisory Council produced a Standard for Breeding Dogs (Appendix 3). The Standard was detailed and written in a manner to enable the efficient inspection of any dog breeder. The Standard was published in September 2012. However the Council was not authorised or financed to establish the inspection process to support the Standard.

The Kennel Club's Assured Breeder Scheme (ABS) has also undergone substantial changes, but initially differed significantly from the Council Standard. A working party was established in December 2012 under the chairmanship of Professor Sir Patrick Bateson with representation from the Advisory Council, the Kennel Club and an independent veterinary surgeon, Mr Harvey Locke. The aim of the working party was to produce a single Standard for Breeding Dogs. After very considerable discussion and amendment the Council approved a revised Standard which is attached at Appendix 3. The revised Standard is, in most respects, equivalent to the Kennel Club Assured Breeder Scheme when taken together with its guidance (Appendix 4).

The Kennel Club has addressed the issue of ABS inspection. The Kennel Club Assured Breeder Scheme was accredited by the United Kingdom Accreditation Service (UKAS) in May 2013. UKAS Certificates are only issued once a member has been inspected and it is established that they fulfil all scheme requirements

The Chartered Institute of Environmental Health (CIEH) established a working party to update their guidance on the enforcement of the Breeding of Dogs Act 1973 (as amended) together with the Animal Welfare Act 2006. The Advisory Council was a major contributor to the working party and much of the guidance it produced was taken from the Council Standard. The document (CIEH Model Licence Conditions and Guidance for Dog Breeding Establishments) was published in January 2014. The Advisory Council is currently in the process of evaluating a check list utilising a simple weighted scoring system for those carrying out inspections.

The Advisory Council joined with other organisations to support the joint BVA-AWF and RSPCA Puppy Contract and the Pup Aid campaign which seeks *inter alia* to ban the sale of young puppies unless their mothers are present.

The Advisory Council worked as part of the Microchipping Alliance to ensure that microchipping of dogs should become compulsory and that all puppies are permanently identified before they leave the breeder and followed best practice in achieving this.

Recommendation 5 *Working with the profession as a whole, the RCVS and the BVA should lead a shift in emphasis towards preventative veterinary medicine rather than simply focus on the correction of problems after they have occurred.*

The RCVS believes that the veterinary profession had embraced the concept of preventative veterinary medicine, particularly in large animal practice, prior to the Bateson Report and that improvements continue to be made, including greater involvement from those in practice. Veterinary surgeons in clinical practice have overwhelmingly demonstrated their support for increased application of their clinical data for epidemiological research by their participation within the RVC VetCompass project. To date, almost 300 practices across the UK have shared clinical data on over 800,000 dogs with the VetCompass project.

The RCVS and BVA have both demonstrated their commitment to strengthening evidence generation using primary-care companion animal clinical data by formally supporting the VetCompass project. BVA also plays a pivotal role in the organisation and delivery of the Canine Health Schemes and its Animal Welfare Foundation is committed to improving the welfare of all animals and a preventative approach is an important aspect of that ethos.

RCVS Knowledge has promoted dissemination of canine health information by supporting development of interactive visualisation tools within the RVC VetCompass project with a target grant award.
http://www.rvc.ac.uk/vetcompass/infographics/
http://www.rvc.ac.uk/vetcompass/infographics/canine

The British Small Animal Veterinary Association is a key contributor to preventative veterinary medicine and has responded as follows:

The BSAVA has a long term commitment to education for veterinary surgeons and veterinary nurses as well as supporting science through research and dissemination of evidence. The organisation has been active in the following areas:

Surveillance, research and development

- 1963 - BSAVA survey (funded by The Kennel Club) recording the incidence of abnormalities known, or believed, to have a hereditary cause presented to veterinary surgeries over a 6 month period;
- Co-operation with The Kennel Club through BSAVA-Kennel Club Scientific Committee;
- 2004 - BSAVA/KC/AHT Purebred Dog Health Survey, a nationwide survey of UK purebred dogs to identify important health conditions in UK;
- Support for clinical research through Petsavers Grants (previously Clinical Studies Trust fund) to the value of £100,000-150,000 per year including support for clinical training scholarships (now replaced by Masters Degree by Research) and individual clinical research projects which have included research into:
    - Congenital deafness (Dalmatian and other breeds)
    - Inflammatory bowel disease in German Shepherd Dogs
    - Inherited myopathy in Great Danes
    - Prevalence and breed distribution of chronic pancreatitis;
- Founder member of the management board of SAVSNET;
- Support for UK DNA archive for companion animals;
- BSAVA recognises the importance of surveillance and evidence based medicine. It is currently investigating ways to play a more active role in disease surveillance in the UK;

- Formation of a charitable company in association with the University of Liverpool to develop the Small Animal Veterinary Surveillance Network (SAVSNET)* into a national surveillance network which will enable research into prevalence of inherited diseases. It will provide a single resource for accessing data on pet animal diseases for veterinary scientists, veterinary surgeons, members of the public and policy makers. The network aims to improve health treatments and reduce the spread of infection amongst pet animals across the UK.

**further detail on SAVSNET is reported under Recommendation 2.*

Legislation and regulation

- Support for compulsory identification of companion animals, for example, by microchip;
- Contribution to the 2006 CAWC report on Breeding and Welfare in Companion Animals;
- Evidence given to the Independent inquiry into Dog Breeding (Bateson report) with support for the conclusion that regulation of breeding must apply to all dogs;
- Response to consultation on Proposed Welsh Legislation on Dog Breeding;
- BSAVA supports the reporting of caesarean sections and procedures which alter the natural conformation of a dog to the Kennel Club;
- Policy statement on suitable practitioners for referral of behaviour cases;
- Response to Defra Consultations on reform of the Dangerous Dogs Act, tackling irresponsible dog ownership, supporting microchipping of puppies and registration to include details of breeder in order to enable traceability;
- Evidence given to Efracom committee on welfare issues relating to dog breeding;
- Response to consultation on non-commercial movement of pets stressing importance of regulation of importing puppies.

Education and publicity

- Information to members at Annual Congress – from a Symposium on Abnormalities and Defects in Pedigree dogs at the fourth Annual Congress in 1963 to discussion of pedigree dog breeding in controversies stream in 2009; Discussion of breeding dogs: How many Caesareans is too many in 2012 and planned press conference on improving genetic and conformational health and welfare 2013; Focus on providing preventive healthcare in Management Stream 2014;
- Commissioned articles on hereditary disease;
- Publication of scientific research as well as educational and review articles on inherited diseases through the association's journals (**Journal of Small Animal Practice** and **Companion**);
- Informing members about puppy contracts, veterinary inspections at championship dog shows and the new BVA/KC health scheme for syringomyelia through articles in association journals;
- Inclusion of chapter on preventive healthcare in the upcoming Manual of Canine Practice (similar emphasis on husbandry and preventive healthcare is included for other species as well);
- Updated position statement on inherited diseases and exaggerated characteristics;
- Updating of Petsavers puppy guide to include advice on selecting an appropriate puppy and preventive healthcare.

In October 2012 the Advisory Council developed and piloted a format and guidance for veterinary surgeons on puppy health checks, supported by the RCVS, the BVA, and the BSAVA (Appendix 5).

Recommendation 6 *When inspecting the premises of breeders that require licences, Local Authorities should address all welfare issues covered by the Animal Welfare Act 2006, especially those relating to dog behaviour. In issuing a licence Local Authorities should specify the staffing levels necessary to ensure appropriate health and welfare, including exercise of parents and socialisation of the puppies. To facilitate this, licensed premises should be required to maintain records of staffing and those records should be available for inspection. Breeders' records should*

be inspected to ensure that breed-appropriate pre-mating tests and screening programmes have been carried out with regard to both parents and that decisions to breed are appropriate in the light of the results.

Various members of the Advisory Council have been involved in working groups whose remit includes local authority issues, for example, irresponsible ownership, dangerous dogs and permanent identification. In addition, the Advisory Council produced a comprehensive Standard for Breeding Dogs (the Standard) and contributed to discussions with the Chartered Institute of Environmental Health to develop guidance on the inspection of licensed dog breeding premises. Some Advisory Council members also served on a joint working party chaired by Professor Sir Patrick Bateson, which included Harvey Locke (independent veterinary surgeon) and Kennel Club members, with the aim of arriving at a single standard for breeding dogs based on the Kennel Club Assured Breeder Scheme and the Council's Standard.

In July 2014 the Council also provided advice to the Government and the Westminster Parliament with respect to an unhelpful amendment to the Deregulation Bill tabled by Defra. The amendment proposed that important requirements for record keeping by dog breeders should be removed *(paragraphs 31 and 32 of Schedule 20)*. The Council regrets that its advice was not sought before the amendment was tabled and other stakeholders were also dismayed by the amendment. The advice subsequently provided by the Advisory Council to Government and stakeholders, including the Associate Parliamentary Group on Animal Welfare and MP's and Members of the House of Lords, is reproduced at Appendix 6. At committee stage in the House of Lords (November 18, 2014) Government undertook to consult before implementation. In summing up the debate Lord Wallace of Tankerness said: "*the Government have been aware of some of the concerns and have decided to consult the key stakeholders on this issue. If there is enough evidence to support retaining the requirement for licensed dog breeders to keep records, the Government will not commence the repeals contained in paragraphs 31 and 32 of Schedule 20."* In addition, Lord Grantchester asked government to provide details of the consultation exercise that had been conducted prior to the amendment being added.

Recommendation 7 *Irrespective of whether they are members of an Accredited Breeder scheme, all breeders should have their puppies microchipped before they are sold. Prospective purchasers should expect that this has been done before buying a puppy.*

The Welsh Assembly Government and the Westminster Government announced their intentions to introduce compulsory microchipping in Wales in 2015 and in England in 2016. The stated intention is that puppies must be microchipped and registered prior to the first change of hands and that this would be supported by appropriate offences and penalties. The English Microchipping Regulations were laid before Parliament on October 28th 2014, the revised Animal Welfare (Breeding of Dogs) (Wales) Regulations were laid before the National Assembly on November 18th and the Welsh Microchipping Regulations will follow after further consultation. Northern Ireland introduced compulsory microchipping in 2012 as part of their existing dog licensing scheme. The Scottish Government have consulted on the principle.

Recommendation 8 *As soon as Parliamentary time permits, Regulations should be made under the Animal Welfare Act 2006 in order to:*

a. Require that all puppies should be indelibly identified, by implantation of microchip or such other equivalent system as may be developed, prior to sale; and that the ID number of the microchip or equivalent should be recorded on the contract of sale, all relevant health test certificates and registration documents and a central data base.

b. Create an obligation on any person breeding dogs to have regard to the health and welfare of both the parents and the offspring of the mating.

c. Require that any body laying down breed standards must have regard to the health and welfare of the dogs and the need to avoid breed specific health problems; and that in exercising such a power, the body could be regarded as exercising a power of a public nature and thus be susceptible to judicial review.

d. Create such offences with regard to the above as seem appropriate.

And

Recommendation 10 *When Parliamentary time permits, regulations should be introduced to replace the various Breeding and Sales of Dogs Acts. In drafting these regulations, consideration should be given to amending the definition of premises that require licensing in order to simplify and make more effective the enforcement of licensing standards and compliance with the provisions of the Animal Welfare Acts. Enforcement authorities should be enabled to carry out inspections on the basis of a risk assessment and to take account of achievement of accredited status under an appropriately enforced and audited accreditation scheme. In order both to facilitate effective enforcement and to encourage a responsible approach to purchasing by the general public, enforcement authorities should be required to maintain a list of licensed premises which is accessible on-line by the public. Consideration should also be given to creating a centralised database of persons who have been convicted or cautioned under animal welfare legislation. The Dangerous Dogs Act should be amended to apply to all dogs that have been shown to be dangerous rather than to specified breeds and should address the problem of dogs being bred and reared specifically as weapons or for fighting.*

For microchipping see the response to Recommendation 7. On 1 September 2013 The Advisory Council delivered to Governments (including the Governments of the UK and Scotland and the Assemblies of Northern Ireland and Wales) and published its Recommendations on Legislation governing the breeding, supply, sale and advertising for sale of dogs (see Appendix 7). Except for the reference to a centralised database of persons convicted or cautioned under animal welfare legislation, and the recommendation relating to Dangerous Dogs which have been dealt with separately, the Council's Recommendations encompassed all the issues raised above in *Recommendations 8 and 10*. The Council understands that this advice was taken into account in the development of the proposed breeding of dogs regulations for Wales (laid before the National Assembly in revised form on November 18, 2014). Sadly, the Westminster Government has not responded formally.

The UK government made some changes to the Dangerous Dogs Act (England and Wales) which came into effect in May 2014 as part of the Anti-Social Behaviour, Crime and Policing Act. No changes were made to the breed specific aspects of the 1991 Dangerous Dogs Act. Similarly in Scotland and Northern Ireland, the breed specific aspects have been retained. Expert advice from bodies like the Dangerous Dogs Act Study Group (which included Council members) had pressed for a *"Deed rather than Breed"* approach.

Recommendation 9 *Defra should implement a statutory Code of Practice on the Breeding of Dogs under Section 14 of the Act. The Code should encompass such issues as:*

a. The health and welfare of the parent dogs.

b. The appropriate screening and testing of parents for breed specific disorders, as laid down in the relevant breeding strategy for the breed (or breeds) concerned.

c. In selection of parents, due consideration being given to compliance with such elements of a breed standard as are intended to avoid extremes of conformation that create welfare problems.

d. The health, welfare and appropriate socialisation of litters of puppies, in order to fit them for their future function.

e. Mechanisms for the sale of the puppies.

f. When UKAS accredited quality assurance schemes address all the issues covered by the code, the Code should recommend membership of such an accreditation scheme.

The Advisory Council set out many of its concerns, including the failure of the UK government to implement a statutory Code of Practice, when Professor Bateson and Professor Crispin gave evidence to the House of Commons Environment, Food and Rural Affairs Committee

(Dog Control and Welfare Seventh Report of Session 2012-13):
http://www.publications.parliament.uk/pa/cm201213/cmselect/cmenvfru/575/575.pdf (Volume I)

Additional written evidence provided: (Volume II):
http://www.publications.parliament.uk/pa/cm201213/cmselect/cmenvfru/575/575vw.pdf

Further, Council has offered to draft a Code of Practice based on its published Standard for Breeding Dogs, but no response has been received from Defra.

Recommendation 11 *The British Veterinary Association should compile, and provide to Local Authorities, a list of veterinary practitioners willing to carry out and/or support inspections of licensed breeding premises.*

The Council has invited the BVA to comment. Currently it is the local authority that licenses dog breeding establishments. Councils may authorise, in writing, any of its officers or any veterinary surgeon to carry out inspections. Some acts stipulate that a veterinary inspector is required (possibly for the first inspection of the new licence only) and that these inspections are carried out by those on an approved list of veterinary surgeons. In view of the matters currently under discussion with regard to record keeping, it would seem sensible for BVA to lead on the best way of ensuring that rigorous inspections are carried out and how best to ensure that those veterinary surgeons on the list, whichever organisation has ownership of such a list, are committed to the task and know the relevant animal welfare provisions.

Recommendation 12 *Complementing all existing schemes, a public awareness and education campaign should be designed by expert practitioners, in order to persuade members of the general dog-buying public to change their behaviour in specific key respects and to provide readily comprehensible information on what questions to ask and what to look for when buying a dog. This should be supported and run by as many as possible of the dog and animal welfare organisations, acting jointly and in unanimity.*

The Advisory Council recognised soon after its formation, confirmed following discussion with our Patrons, that it was in no position financially to lead on education and publicity and should focus on the first three objectives set by the Dog Welfare Review Board (see detailed response to Recommendation 1). It could however help to facilitate the good work of others and has encouraged welfare bodies and commercial organisations to work together on a joint publicity campaign.

The Advisory Council designed, delivered and launched (May 2012) a web-based tool, complementing those used by other stakeholders, supporting decisions on whether and how to buy a dog, and which breed or type is best suited to a prospective owner's lifestyle. Feedback on the tool has been positive from users as widespread as the UK, USA, and Australia.

Recommendation 13 *When robust and audited accreditation scheme(s) are available, the buying public should be pointed with confidence towards the accredited breeders as offering a genuinely higher standard of health and welfare to the animals in their care and thus towards a fit, healthy and appropriately socialised puppy.*

No such scheme yet exists, although the Kennel Club Assured Breeder Scheme has made significant improvements in this direction – see also the response to Recommendation 4.

The Kennel Club has responded:

> *"The Kennel Club now has accreditation from UKAS to certify breeders under the ABS. At all times the Kennel Club points puppy buyers towards Assured Breeders first but we need far greater support from other organisations in both the veterinary and welfare sectors to promote the Assured Breeder Scheme in order to ensure that puppy buyers receive a clear message as to who they should go to in order to buy a healthy puppy. Some organisations continue to question the validity and standards of the KC ABS which is unhelpful to puppy buyers and contrary to a single message."*

The Council's endorsement of the standard set by the Kennel Club Assured Breeder Scheme is set out in the response to Recommendation 4. However, KC ABS members still currently represent only a small percentage of those who register their dogs with the KC and an even smaller percentage of the total number of dogs bred in the UK. Until there is an agreed scheme applicable to all dogs whether pedigree, pure-bred or cross-bred, which conforms to an agreed Single Standard for Breeding Dogs, this recommendation cannot be met in full.

The popularity of the Internet, social media and private sites for advertising the sale of dogs also presents its own challenges in more successfully directing the public to buy only from those breeders who offer a genuinely higher standard of health and welfare to the dogs they breed and sell. Organisations such as the Pet Advertising Advisory Group should continue to make every effort to expand, enforce and maintain minimum standards for the sale of dogs from both private and public online classified Internet and social media sites. It is vital that the general public understands the importance to long term canine health and welfare of never buying any dog unless it comes from a *bona fide* source, where breeder accountability and traceability is transparent and easily identifiable.

Changes to the regulations on the importation of puppies from other EU countries have led to a significant increase in the numbers coming into the UK, an issue that has involved many with animal welfare concerns, including Advisory Council members. As there is no regulation of the manner in which those puppies are bred, together with criminal involvement, there has been an overall reduction in the welfare of both puppies and breeding stock. Dogs Trust has just completed (November 14, 2014) a six month undercover investigation (The Dark Side of the Christmas Puppy Trade) which has confirmed extensive abuses of the Pet Travel Scheme and serious animal welfare problems in consequence.
https://www.dogstrust.org.uk/whats-happening/news/the-puppy-smuggling-scandal

Recommendation 14 *The report by APGAW (2009) was published in November 2009. As I have already noted, their brief was narrower than mine, but where the focus of the two inquiries overlap, the recommendations should be brought together. I welcome the suggestion of the RSPCA that a meeting of the relevant parties should be convened as soon as possible after the publication of the present report.*

The Dog Welfare Review Board, incorporating all key stakeholders with an interest in dog welfare, was established in 2010 to address the issues arising out of the three reports published on dog welfare. The recommendations were summarised, compared and reconciled by the Advisory Council Secretary for discussion by members of the Dog Welfare Review Board. Their main conclusion was to endorse the need for an independent Advisory Council to address the issues arising from all three reports.

In consequence, the recommendations from APGAW and the RSPCA, as well as the Bateson recommendations were brought together as suggested. Key stakeholders have met regularly with the Council during its term of office to review progress made by all parties.

RECOMMENDATIONS FOR FUTURE ACTION

1. There is considerable confusion about the best means of delivering informed independent advice in relation to dog health and welfare. The situation would benefit from a formal review and the Dog Welfare Review Board or a similar grouping of key stakeholders could be reconstituted to carry out such a review and, additionally, provide a forum that encourages reciprocal stakeholder collaboration through which to monitor progress in tackling canine health and welfare issues.

2. BVA/BSAVA in conjunction with others (for example, VetCompass and SAVSNET) should take the lead in coordinating data collection schemes nationally and internationally. It is important that such work is carried out in conjunction with the Kennel Club via its KC Breed Health Co-ordinator teams.

3. A Trust Fund created by the Advisory Council will provide support for scientific research connected with the health and welfare of dogs and will aim to give priority to a project or projects which contribute to addressing the need identified in the Bateson Report to provide *"statistically significant prevalence data for each breed"* - particularly those *"creating the greatest welfare challenges."*

4. The "How to Buy a Dog" webtool will be housed on the University of Cambridge and Animal Health Trust websites to continue to complement other similar information sites and applications.

5. Now that the Council's Standard for Breeding Dogs and the KC Assured Breeder Scheme (ABS) Standard and Guidance when taken together deliver equivalent levels of health and welfare, the next challenge is to encourage take up of a single standard by breeders of both pure bred and cross bred dogs alike. This will only happen if the demand for 'Assured' puppies provides market pull such that breeders outside the Scheme cannot find a market for their puppies. The need is for a concerted awareness, including a publicity campaign to draw the attention of puppy buyers to the dangers of purchasing dogs from other less reputable sources.

6. The BVA will explore the possibility of publishing Council recommendations on the priority welfare conditions on the new BVA website so that this valuable information may be easily accessed for any future projects and scientific and clinical study.

7. The Westminster Government eagerly anticipated the Council's advice on legislation in a number of responses to Parliamentary Questions. It is sad, therefore, to note that the Council has not received a formal response to the advice provided, particularly as many of the Council's conclusions with regard to the efficacy, or otherwise, of the enforcement of existing controls have been repeated in the recent report on the RSPCA (Independent review of the prosecution activity of the Royal Society for the Prevention of Cruelty to Animals, Stephen Wooler, September 2014).

The Council's advice on legislation will now be lodged formally with the Canine and Feline Sector Group; this group was established in 2013 with the mission of improving the health and welfare of dogs and cats.

8. The RSPCA has agreed to continue to fund the Working Group addressing the issues of selection for extremes of conformation. The Group will be chaired by Dr David Sargan.

Appendix 1

First Advisory Council Report and Recommendations on priority welfare conditions

Problems of an inherited or breed-related nature

Introduction

Dr Cathryn Mellersh

Although there has been considerable scientific debate over precisely how, when and where dogs were domesticated it is universally accepted that the wolf is the common ancestor of *Canis familiaris*, the modern domestic dog. It is still not clear precisely how many origins of domestication there were but a consensus view is that the modern dog originated from as many as several hundred different wolves, most probably from South-East Asia but possibly also from the Middle East, and that ancestors of those very early dogs followed humans, the species that would quite literally *'shape their evolution',* across the entire globe.

Canid bones and teeth retrieved from archaeological sites have revealed considerable variation in the size and bodily proportions within populations of dogs in the prehistoric period but it is unlikely that distinctive 'types' of dogs appeared until about 3000-4000 years ago. Dogs of a greyhound type, for example, are frequently depicted on paintings and pottery from Egypt and Asia and by Roman times hunting dogs, guard dogs, herding dogs and lap dogs were all common. During the 10,000 or so years since the early domestication events man has selected for an increasingly diverse range of conformational and behavioural characteristics that reflect the variety of different tasks he has required his dogs to perform.

These characteristics form the basis of today's modern standards for the 400 or so different breeds that are recognised worldwide. Nowadays, however, few dogs truly work for a living, with a small minority being exhibited in the show ring and the vast majority being kept as companions. For some breeds this role-shift has been accompanied by a change of selective pressure from one of function to one of form.

It can be argued that the development of *'breeds'* with closed stud books and the birth of the dog show, both relatively recent developments in the overall history of the domestic dog, jointly account for the majority of the health concerns that apply to modern breeds of dog.

The problem with closed breed stud books, from the perspective of genetic diversity, is that modern breeds of dog are genetically isolated, with new genetic material being introduced only rarely. The desire of those who breed dogs to produce animals that adhere strictly to a breed standard means that only a small subset of each generation is typically used for breeding, and that certain males (the *'popular'* sires) produce a disproportionate number of offspring compared to others. The overall effect is that many breeds are characterised by very small effective population sizes and high levels of inbreeding, the effect of which is that spontaneous, deleterious mutations can become concentrated within populations, leading to high incidences of specific inherited conditions in certain breeds. These *'primary'* inherited disorders result directly from harmful mutations and are not usually associated with characteristics that have been selected for by breeders. The possibility exists, therefore, to eliminate such causal mutations by appropriate breeding strategies without affecting *'breed-type'.*

In contrast, it is not possible to reduce the frequency of any disorder that occurs as a secondary condition until the underlying cause has been controlled. Many such serious and debilitating secondary conditions are a direct result of specific, often exaggerated, physical body types that have been directly selected for. Extreme physical features evolve slowly, over time, and arise primarily from a *'more-is-better'* mindset. For example, many breed standards specify dogs should have *'tight eyelids'*; tight eyelids do not cause problems, but over-tight eyelids certainly do. So a tendency to breed with dogs that are at the extremes of breed standards, or that display characteristics that are slightly bigger, better or more ostentatious than the dogs currently enjoying success in the show ring, will gradually produce dogs that are increasingly extreme. If these dogs still had to function beyond the show ring, the reduced biological fitness associated with grossly

exaggerated features would be self limiting, but in the absence of such selective pressure they can be allowed to persist. For health disorders that arise as a direct result of extreme physical body type the only solution, beyond continuing to treat individual affected dogs, is to breed dogs with a less exaggerated form.

This brief document sets out the initial problems that have been identified by the members of the Advisory Council on the Welfare Issues of Dog Breeding as representing major welfare issues for dogs today and discusses ways in which their impact could be reduced. The problems identified are visible and consist of inherited disorders that are either primarily associated with spontaneous, deleterious mutations or are secondary to an underlying (primary) physical characteristic. All are considered to be a potential or actual cause of pain and suffering.

Ocular problems linked to head conformation

Professor Sheila Crispin

What happens when we select for characteristics that change the shape of the head? Not much if we retain the proportions of the normal skull shape, but potentially calamitous if we seek to exaggerate certain features and end up with, for example, heads that are foreshortened and flat, heads with excessive amounts of loose skin, eyes that are abnormally prominent, or eyes that are too small. Such gross exaggerations may result in acute pain or chronic low grade misery. It seems odd that humans have over the years, consciously or unconsciously, encouraged exaggeration in the dogs that they breed and that such exaggeration is often found in dogs that are bred for showing – a situation that might never have arisen if showing had always included a strong working element as part of the assessment. In many working dogs, looks do not matter, but the ability to work is paramount.

Foreshortening of the head with flattening of the face

Dogs with flattened faces, such as the Pekingese and Pug, have a rather shallow orbit, so the eyes are prominent and easily damaged. At worst this means that relatively mild head trauma, or even careless handling, can result in eyeball prolapse – the eyeball is no longer retained in the orbit and this kind of damage almost always results in the affected eye becoming blind.

The eyes of such dogs are also susceptible to direct trauma, related both to their prominence and the fact that such animals may not be able to blink completely or effectively. The tear film may not be adequately spread over the cornea in consequence and excessive evaporative loss of the tear film is common.

Failure to blink adequately can result in abnormal spreading of the tear film and this can be a cause of chronic damage to the cornea (exposure keratopathy) and areas of corneal drying (desiccation) with secondary erosion and ulceration, as well as permanent opacity may result. Excessive evaporative loss of tears because the eyes are so prominent can exacerbate the situation. Some affected animals can become blind if the corneal opacities, especially those caused by pigmentary keratitis, are extensive. The situation is often exacerbated because dogs with prominent eyes have poor corneal sensitivity. This means that ulcers, which are relatively common in dogs of this type, can be difficult to manage, as complications such as progressive deepening of the ulcer and even corneal perforation can occur.

Because the eyes are so prominent the eyelids are very closely opposed to the cornea (the *'tight'* to '*overtight'* eyelids referred to in the introduction) and there is often a rather subtle turning in (entropion) of the lower eyelids at the inner corner of the eye (lower medial entropion). When the lower eyelid turns in, the skin hairs rub against the eye, producing discomfort and even frank pain. Tear staining is also likely because the close apposition of the eyelids to the eyeball makes it physically difficult for the tears to drain normally, especially so if fine hairs in the caruncular region act as a wick. Any irritation to the eye from adnexal hairs or nasal folds, will stimulate tear production and make tear staining even more obvious.

Dogs with prominent eyes will also develop problems if anything compromises tear production. There are many causes of dry eye; for example, it may be present from birth (congenital) or immune-mediated in some breeds, but a cause to emphasise in the context of conformation is dry eye directly caused by removal of the nictitans gland with or without excision of the third eyelid. The nictitans gland lies beneath the third eyelid and is an important contributor to tear production. Prolapse of the gland, colloquially referred to as 'cherry eye', is a relatively common problem in some of the flat-faced breeds such as the Bulldog and the gland should always be replaced surgically rather than removed, in order to avoid causing unnecessary welfare problems.

In addition to this litany of common problems, some of the flat faced breeds also have the potential for corneal damage from hairs, either from the nasal folds, or the fine hairs that are so common in the caruncular region of the inner corner of the eye, with or without any inturning of the lower eyelid, or because of extra eyelashes (distichia) on the eyelid margins. Extra eyelashes (distichiasis) are common in many breeds of dog (for example, the Cocker Spaniel, American Cocker Spaniel, Welsh Springer Spaniel, Flat Coated Retriever) and are not necessarily a cause of clinical problems, but in breeds such as the Pekingese and Bulldog, which may have distichiasis as well as prominent eyes, an inadequate protective blink and poor spreading of the tear film, there is increased risk of corneal damage.

Chronic corneal changes are likely over time, most commonly observed as pigmentary keratitis. Slit lamp examination in these dogs usually reveals the presence of fine blood vessels, not always easy to see when pigment obscures them.

Long nose, micropalpebral fissure, small eyes

The presence of a *long nose* tends to cause relatively minor clinical problems, notably accumulation of mucus at the inner canthus as the only abnormality. This type of abnormality is common in breeds like the Dobermann and Rough Collie.

If there is a narrow eyelid aperture *(micropalpebral fissure)* or eyes that are smaller than normal *(nanophthalmos – a small but normal eye, microphthalmos – a small abnormal eye)* the result may be entropion and varying degrees of visual impairment, irrespective of whether the nose is over-long. When the upper eyelid turns inward, the irritation to the eye comes from the eyelashes (trichiasis) as well as skin hairs. There was a tendency to breed for small eyes in some breeds, notably the Chow Chow, Rough Collie, Smooth Collie and Shetland Sheepdog, in the past, but breeders adopted a more sensible approach once it became apparent that small eyes could be abnormal and vision compromised.

Heads of variable size, with loose or thickened skin, with or without foreshortening

Excessive amounts of loose skin contribute to very poor eyelid anatomy but also provide an excellent medium for the growth of various organisms in any part of the body where they occur (nasal folds, lip folds and leg folds for example). Skin problems are discussed in more detail below.

The poor eyelid anatomy is largely a consequence of the anatomy of the head and the excessive amounts of skin. The conformational deformities of the eyelids, which may be overlong, and abnormal support at the outer corner of the eye can produce a combination of entropion (eyelid turning in) and ectropion (eyelid turning out) – a macropalpebral fissure. The deformities result in a so-called 'diamond eye' with a characteristic kink in the central portion of the upper and lower eyelids and, most commonly, upper lid entropion and lower lid ectropion. The entropion is a possible source of corneal damage and pain because of direct mechanical abrasion of the cornea from eyelashes and skin hairs. The ectropion results in chronic conjunctival exposure and drying; chronic conjunctivitis and a greater likelihood of infection result.

Affected dogs cannot blink effectively because of the abnormal eyelid anatomy, so there is inadequate distribution of the tear film and a tendency to develop corneal complications (exposure keratopathy and desiccation). For the eyelids to function effectively they should be in contact with the eyeball and the margins should be adjacent to the eyeball (congruent).

The poor eyelid anatomy means that the upper and lower drainage holes (lacrimal puncta) are usually out of position and this may result in tear overflow with unsightly tear staining. Such tear staining may also result in dermatitis (inflammation of the skin) and secondary infection of the area that is continually wet.

It is not unusual to have additional problems such as kinking of the cartilage of the third eyelid and prolapse of the nictitans gland in various large and giant breeds of dog. Kinking may be accompanied by tear staining and, or, a mild ocular discharge. The problem can be corrected by excision of the kinked cartilage. The third eyelid should never be removed in these circumstances, because it helps to distribute the tear film and partly compensates for the conformational deformities of the upper and lower eyelids. Prolapse of the nictitans gland (cherry eye) may also occur in large and giant breeds and the gland should be replaced surgically rather than removed.

A number of breeds of smaller size have a tendency to entropion because of excessive amounts of thickened skin, sometimes as part of a more widespread medical condition called mucinosis, not uncommon in the Sharpei for example. In some breeds the eyes are also relatively small (see earlier), a feature that makes it much easier for the eyelids to turn in, or for the normal relationship between eyelid and globe to be adversely affected.

Breed-related anatomical entropion and ectropion may also be seen as the only abnormality in many breeds, including cross-breeds. The abnormalities are usually present at a relatively young age, sometimes when the dog is still a puppy.

Summary

- The ocular problems that accompany poor head conformation may cause chronic low grade misery that, at worst, may lead to complications which result in severe pain and blindness;
- Affected animals often require frequent medical therapy, which is time consuming, expensive, unpleasant for the dog, and not always easy for the dog's owners to administer;
- Surgical correction may be required and is often complicated, especially as more than one operative procedure may be needed. Complex surgical procedures can be very expensive and dogs that have had this type of surgery cannot be shown;
- The abnormalities associated with poor head conformation are not limited to the eye and adnexa (eyelids, lacrimal system, orbit and para-orbital region), but may include respiratory problems, inability to thermo-regulate efficiently, infections in skin folds, skin excoriation from constant escape of saliva (drooling) or tears (as a result of both tear overflow and excessive lacrimation because of pain and discomfort).

Recommendations

1. Avoid breeding from dogs with exaggerated conformational defects and do not breed from a sire and dam that share the same gross exaggeration;
2. Keep breed standards under constant review and continue to modify them so that exaggerated conformation is no longer considered to be acceptable;
3. Ensure that dogs with exaggerated conformational defects cannot be shown;
4. Judicious outcrossing may be needed as a 'quick fix' in those breeds where poor head conformation is invariably accompanied by clinical problems that are a source of ocular damage, pain and discomfort, but if breeders can avoid this by the selection of clinically unaffected dogs for breeding, it will provide a strong driver for change;
5. Ocular examination (the eye and adnexa) under, most commonly in the UK, the BVA/KC/ISDS Eye Scheme, combined with the relevant genetic laboratory tests, should be regarded as routine for all dogs used for breeding;
6. Selection for smaller heads within a breed, or outside the breed, may be needed for those bitches that require routine Caesarian Section for the birth of their puppies. The ethical, health and welfare implications of assisted reproduction mean that natural birth, rather than Caesarian Section, must become the norm.

Breathing difficulty linked to head conformation

Professor Dan Brockman

Breeding for a flatter face has consequences for upper airway function that can be seriously detrimental to the quality of life and the lifespan of affected individuals. Selective breeding has led to extreme foreshortening or effective absence of the bones of the nose in several breeds. The effect of this is a short or absent nose and the creation of an upper airway that is:

1. Highly resistant to air flow;
2. Cannot be modified to allow more airflow at times of high demand;
3. Is less effective at dissipating heat;
4. Is less effective as a sense organ.

Although the tip of the nose (nasal planum) is still present in these animals, it is so distorted that airflow is severely restricted. Inside what is left of the nasal cavity, the scrolls of thin bone (turbinates) responsible for heat dissipation and contributing to the sense of smell, are also distorted and crammed into such a tiny space that they protrude into the airway behind the nasal passages (nasopharynx) creating further obstruction to airflow.

In the back of the mouth (oropharynx and common pharynx) the soft tissues, most importantly the soft palate, tongue and pharyngopalatine mucosal folds, have not reduced in size in concert with the bony foreshortening that has taken place. The combined effect of this is that the pathologically long soft palate and the relatively large tongue-base occupy another space (the pharynx) where air should freely flow. At its worst, the pharyngeal component of these animals' disease is life threatening, but a long, thick soft palate can also lead to snoring, sleep apnoea, disordered/disturbed sleep patterns, all of which could result in chronic fatigue and behavioral abnormalities such as irritability/aggression.

Finally, the opening of the conducting airway (the larynx) is often weak, either as a primary component of the disease or secondary to constant exposure to a high pressure gradient, so that it partially or completely collapses. The addition of laryngeal complications in combination with the other components (nasal and pharyngeal) is what usually precipitates an obstructive airway crisis.

There are several other consequential effects that may result from the chronic need to generate high pressure gradients between the airways and the atmosphere such as; tracheal hypoplasia, bronchiolar collapse, and gastrointestinal consequences (regurgitation/hiatal hernia).

Surgical palliation consists of removal of redundant/abnormal tissue from the nostrils (rhinoplasty), the nasopharynx (ethmoid turbinectomy), the soft palate (partial staphylectomy) and the larynx (removal of the mucosa of the laryngeal ventricles). Salvage operations for affected animals include laryngoplasty and permanent tracheostomy. No combination of these is curative and all such airway surgery is considered high risk. Severely affected animals cannot survive without intervention and many die despite this. Less severely affected dogs are unable to function normally in situations of relatively minor excitement or stress, such as playful exercise. Put simply, during normal or routine activities, the body of affected animals writes cheques for oxygen that the airways simply can't cash. Affected animals are not fit for a normal life.

Summary

- The breathing problems that accompany poor head conformation cause increased lifetime risk for acute airway obstruction and long term compromise to airway function that can result in reduced quality of life.

- Animals with an acute obstructive crisis can die despite medical attention but often require expensive surgical therapy and intensive care to recover from such an event.

Recommendations
Short term

1. Stop breeding from dogs with exaggerated/extreme conformational defects and do not breed from a sire and dam that share the same gross exaggeration;
2. Ensure that dogs with exaggerated conformational defects cannot be shown.

Intermediate term

3. Promote gathering of data using tested research methods to generate an evidence base that will allow legitimate anatomical conformational limits to be recommended;
4. Define healthy conformational limits using scientific data;
5. Make breed standards conform to healthy conformational limits;
6. May require judicious outcrossing programmes to restore brachycephalic breeds to a phenotype that is truly fit for life.

Syringomyelia (SM) and Chiari-like malformation (CM)

Dr Clare Rusbridge

What is syringomyelia and Chiari-like malformation?

Syringomyelia is characterised by fluid filled cavities (a syrinx or syringes) within the spinal cord. SM occurs secondary to obstruction of the flow of fluid (cerebrospinal fluid or CSF) around the spinal cord, especially if that obstruction is at the junction between the skull and the neck bones (foramen magnum). The most common predisposing cause in the dog is Chiari-like malformation. The primary clinical sign of CM/SM is pain, either due to obstruction of the fluid and/or a neuropathic pain syndrome due to damage to the spinal cord.

Chiari-like malformation is a condition characterised by mismatch in volume between the brain (relatively too big) and the skull (relatively too small) such that the cerebellum and brain stem are herniated into or through the foramen magnum.

How common is syringomyelia and chiari-like malformation?

Brachiocephalicism and miniaturisation appear to be risk factors for CM. The condition is most commonly reported in toy breeds such as the Cavalier King Charles spaniel (CKCS), King Charles spaniel, Griffon Bruxellois, Affenpinscher, Yorkshire Terrier, Maltese, Chihuahua, Pomeranian and Papillon. Partly because of its popularity as a pet, the CKCS is overrepresented. Studies into the inheritance of SM associated with CM in the CKCS have shown it to be a complex trait with a moderately high heritability. It has a varying age of onset – there is 46% prevalence in asymptomatic breeding CKCS, but prevalence increases with age and may be as high as 70% in dogs over six years of age.

Does head conformation contribute to Chiari-like malformation?

Selection for a smaller dog and brachycephalic head shape is undoubtedly a contributing factor in canine CM/SM. However it is not the only explanation as CM/SM is uncommon in some brachycephalic breeds such as Japanese Chin, Pugs and Pekingese. These breeds are less predisposed because although these dogs have small volume skulls the brain size is also smaller i.e. it fits in the skull. Some experienced breeders of toy dogs predisposed to CM/SM acknowledge that a *'more is better'* approach to show breeding may be a contributing factor in the increased prevalence of CM/SM. For example what used to be considered a short high set nose in the Griffon Bruxellois is now no longer short enough to do well in shows. In selecting for certain skull and facial

characteristics breeders are unwittingly selecting for craniosynostosis i.e. premature skull suture fusion. When one compares the descriptions of some craniosynostosis syndromes associated with Chiari type I malformation, e.g. Crouzon syndrome, there is a disturbing similarity to some conformation points desired by show breeders

Features	**Crouzon syndrome (branchial arch syndrome)**	**Conformational points desired in one brachycephalic toy breed predisposed to CMSM**
Skull	Brachycephaly (short and broad head.	Broad head, with rounded and often domed skull. Head large in comparison to body.
Ears	Low-set ears and high prevalence of ear canal malformations	Semi-erect, high-set, the smaller the better.
Eyes	Exophthalmos (anterior displacement of the globe as a result of a shallow orbit after early fusion of surrounding bones) Hypertelorism (greater than normal distance between the eyes) Lateral strabismus	Large* and wide spaced eyes The 'large' eyes desired by some breeders appear larger because the orbit is shallow rather than because the eyeball is enlarged Showing excessive white in corner of eyes (lateral strabismus) considered desirable by some
Nose	Psittichorhina (beak-like nose)	Nose placed between the eyes and as short as possible.
Chin	Concave face and protruding chin because of insufficient growth of the upper jaw (hypoplastic maxilla)	Lower jaw curves upwards, and should protrude beyond the upper jaw

What are the clinical signs of syringomyelia and Chiari malformation?

The most important and consistent clinical sign of CM/SM is pain, however this may be difficult to localise. Owners may describe postural pain; for example pain on jumping or being picked up. Sleeping with the head in unusual positions may be reported. Pain is positively correlated with syrinx width and symmetry i.e. dogs with a wider asymmetrical syrinx are more likely to experience discomfort and dogs with a narrow symmetrical syrinx may be asymptomatic. Syrinxes can progressively expand and a dog which is asymptomatic in early life may suffer pain later. Dogs with a wide syrinx may also scratch, typically on one side only, while the dog is walking and often without making skin contact, such behaviour is often referred to as an *'air guitar'* or *'phantom'* scratching. Dogs with a wide syrinx are also more likely to have curvature of the spine (scoliosis). SM can result in other neurological deficits such as weakness and poor coordination. Seizures, balance (vestibular) disorders, facial nerve paralysis (Bell's palsy) and deafness may also be seen; however, no direct relationship has been proved and this association may be circumstantial.

CM alone appears to cause significant head and spinal pain in some dogs.

How is syringomyelia and Chiari malformation diagnosed?

Magnetic resonance imaging (MRI) is essential for diagnosis and determining the cause and extent of SM.

How is syringomyelia and Chiari malformation treated?

The main treatment objective is pain relief and dogs may be medically and/or surgically managed. There is no cure and, at best, treatment improves signs. The clinical signs of CM/SM are often progressive – a recent study found that approximately three-quarters of CKCS with CM/SM-associated neuropathic pain will deteriorate on conservative treatment only. The most common surgical management is cranial/cervical decompression (also described as foramen magnum or sub-occipital decompression) in essence creating more space for the brain by removal of bone. Due to the persistence of SM and/or spinal cord dorsal horn damage it is likely that the post-operative patient will also require continuing medical management for pain relief and in some patients medical management alone is chosen because of financial reasons or owner preference. There are three main drugs used for treatment of CM/SM: drugs that reduce CSF production e.g. cimetidine or omeprazole or possibly diuretics such as furosemide; analgesics; and corticosteroids. Simple actions, for example raising the food bowl and removing neck collars, can also help.

How can syringomyelia and Chiari malformation be prevented?

Breeders

It is recommended that breeders of dogs predisposed to CM/SM screen their stock. A British Veterinary Association (BVA)/Kennel Club (KC) CM/SM Scheme has recently been introduced; the purpose of which is to reduce or eliminate the incidence of inherited CM and SM in dogs. To participate in the scheme, owners will need to have their dog MRI scanned in a veterinary practice and many practices offer a reduced cost CM/SM MRI service. The MRI scans are reviewed by two scrutineers from a BVA-appointed panel of neurologists and radiologists and are graded for severity for both CM and SM. The age at the time of MRI is also taken into account. Results for Kennel Club registered dogs are sent to this official body and it is intended that they will be listed on the online Health Test Results Finder. Results are also sent to the Animal Health Trust, to be included in Estimated Breeding Value (EBV) calculations for a Mate Select Computer programme.

Estimated Breeding Values have the advantage that they are available for all registered dogs, even if the dog has not been MRI scanned or is below the minimum age for screening. They also have the potential to eliminate environmental factors normally associated with a complex trait. Breeding guidelines are also available for the breeds and crossbreeds which do not have an EBV scheme (for more information see http://www.veterinary-neurologist.co.uk/Syringomyelia/BVA-kc-2/). These guidelines concentrate on removal of dogs with early onset SM from the breeding pool.

Pet Owners

Owning a dog with CM/SM can be distressing and expensive. It is recommended that people wishing to purchase a breed of dog susceptible to Syringomyelia:

- Ask to view the CM/SM reports or certificates for the parents and grandparents. When EBV results from the scheme are available the EBV of the puppy should indicate low risk for CM/SM. A responsible breeder uses health tests and is keen to show a puppy buyer their certificates. Any dog MRI scanned in the UK since February 2012 should have a KC/BVA scheme certificate (coloured purple). Dogs imaged prior to this, or from other countries, should have an MRI report signed by a European or American diplomate in Veterinary Neurology or Radiology.
- Ascertain that the breeder is adhering to the appropriate Breed Club guidelines e.g. age at breeding and screening for other inherited diseases.

Veterinary Surgeons

If a dog has an MRI diagnosis of CM/SM, then the Kennel Club registration and or pedigree details should be submitted, together with the MRI report, to the Animal Health Trust, for inclusion in the EBV database.

Future direction

Work to identify the genetic cause of Chiari-like malformation and syringomyelia is in progress, with a view to eventually establishing a DNA screening test.

There is concern that, in some breeds, CM is so common that it may be a fixed genetic trait. The subsequent development of SM may be dependent on other modifying or protective genes which influence severity and age of onset. It is possible that attempting to select for SM-free dogs by using an EBV Mate Select Programme may merely select for protective traits, reducing the incidence of clinical and early disease, but without reducing the prevalence of the main gene(s) for SM associated with CM. In this instance the only way to reduce the incidence of disease would be to introduce new DNA by outcrossing to a different breed that does not have inherited CM.

Summary

- CM/SM is an inherited disease which can cause chronic pain and disability and is prevalent in several toy breed dogs
- Even with treatment many dogs with CM/SM continue to suffer pain and distress.
- Diagnosis of CM/SM is by MRI which is expensive and often requires referral to specialist facilities.
- Treatment for CM/SM is often life-long and the signs of CM/SM are progressive in many dogs.

Recommendations

1. Breeders of dogs predisposed to CM/SM should screen their stock though an official scheme and base their breeding choices on an EBV system (if available);
2. Prospective pet owners should be advised on how to select a puppy with a lower chance of inherited disease;
3. Veterinary surgeons should be encouraged to submit pedigree information about dogs clinically affected with CM/SM to a central database;
4. Research into more effective treatment for, and prevention of, CM/SM should be continued.

Idiopathic Epilepsy

Dr Clare Rusbridge

Seizures and Epilepsy

A seizure is caused by abnormal electrical activity in the brain and is characterised by a sudden episode of transient neurologic signs such as involuntary muscle movements, sensory disturbances and altered consciousness. Seizures can be generalised, i.e. affecting both cerebral hemispheres (sides of the brain), or focal (partial) where the electrical disturbance is limited to a specific area(s) of the brain. The most common seizure type in the dog is a generalised tonic-clonic seizure characterised by stiffening of the limbs (the tonic phase), followed by jerking of the limbs and jaw (the clonic phase).

Seizures are traditionally divided into intracranial causes (i.e. structural or functional brain changes) and extracranial causes (e.g. hyperthermia, metabolic disease, abnormal blood parameters, poisons and toxins). Recurrent seizures are characteristic of epilepsy (i.e. more than one seizure due to an intracranial cause). Intracranial causes of epilepsy can be separated into primary (also known as idiopathic/genetic/hereditary) and secondary (also known as structural/metabolic, acquired, symptomatic, cryptogenic).

Idiopathic epilepsy is defined as epilepsy with a suspected hereditary predisposition and not in consequence of some other disease or injury. In the dog the epileptic seizures generally start between 1 and 4 years of age, although a number of dogs may be older at first presentation. The dog is generally described as normal between seizures, although some may have behavioural problems, especially if the seizures are poorly controlled; for example, problems such as excessive

fear/anxiety, abnormal perception (e.g. barking without apparent cause), abnormal reactivity, attachment disorder, demented behaviour, apathetic behaviour and aggression.

How is idiopathic (inherited) epilepsy diagnosed?

The list of possible causes of seizures is daunting and when working up an epileptic patient a systemic approach is advisable to *"narrow down"* the likely possibilities and rule out non-inherited causes of seizures. Unfortunately, with the exception of the Lagotto Romagnola (juvenile epilepsy) and Miniature Wire-haired Dachshund (Lafora's disease) there is no definitive test for inherited epilepsy.

After neurological examination, magnetic resonance imaging (MRI) or computed tomography (CT) are the most helpful tests to evaluate the epileptic patient. However, unless the dog has had recent seizures or cortical atrophy secondary to severe seizures, a dog with idiopathic epilepsy will have normal brain MRI. In addition, for dogs with idiopathic epilepsy obtaining a MRI scan does not necessarily help with determining prognosis or treatment.

Can idiopathic epilepsy be successfully treated?

Epilepsy can be successfully treated in the majority of cases and most animals enjoy a good quality of life. Treatment is aimed at reducing the frequency, duration or severity of the seizures. It is unusual for the seizures to stop altogether. Anti-epileptic drugs (AEDs or anticonvulsants) are the mainstay. The name-tag is somewhat inappropriate as the mode of action of most AEDs is to suppress seizures rather than cure epilepsy. AEDs are not without adverse side effects, of which the most common are drowsiness with increased appetite and urination. Lifelong treatment and monitoring is also expensive. In dogs it is estimated that one-third of all individuals with epilepsy are refractory to AED therapy, for example, a high level of drug resistance has been reported in epileptic Border Collies. Many individuals with drug-resistant epilepsy are unresponsive to multiple drugs with a wide range of mechanistic actions.

How common is idiopathic epilepsy?

It is generally regarded that epilepsy has a prevalence of 1-2% in the dog population and many dog breeds are predisposed to epilepsy; the inherited diseases in dogs website (http://www.vet.cam.ac.uk/idid/) lists 42 breeds. The studies needed to gain a more accurate insight into the disease require a high level of breed club and individual breeder cooperation. Understandably there is often an unwillingness of breeders to reveal that one of their dogs is epileptic; this combined with a complex mode of inheritance and difficulty in making a definitive diagnosis means that there is a paucity of studies in this area. In addition some dogs with inherited epilepsy develop their first seizures subsequent to being bred from.

The inheritance of canine epilepsy has not been determined in the vast majority of breeds and in most breeds is likely to be complex. In some breeds, male dogs are more likely to have seizures than females.

What is the welfare impact of idiopathic epilepsy?

Although many dogs can be successfully treated, a diagnosis of epilepsy has serious implications for both pet and owner. Dogs with epilepsy have an increased risk of premature death as compared to the general population of dogs. Rarely, sudden unexpected death in epilepsy (SUDEP) may occur. Owning an epileptic dog can be problematic. Medication is usually given at set times which may impact on work schedules and social life. The ability to have holidays may be compromised, as leaving the dog in a boarding kennel without 24 hours supervision may not be advised. If the dog is prone to clusters of seizures then during the cluster the owner may feel unable to leave the dog unattended. In addition, the side effects of AEDs can have a daily impact on the dog, for example increased drowsiness and predisposition to other disorders like obesity, as well as long-term complications of therapy such as liver disease. Some owners request euthanasia of their epileptic dogs because of the cost of managing the condition, or because of the real or perceived impact on family life.

Summary

- Idiopathic epilepsy is a disease with a major welfare impact which is not curable in most dogs and often requires life-time management.
- The tendency to develop idiopathic epilepsy is inherited in many breeds, although the precise mode of inheritance is usually unknown. There is no definitive test in the majority of cases and therefore no easy way for a breeder to select dogs that do not have this inherited tendency.

Recommendations

1. Co-operation between breeders, breed clubs and researchers is paramount. This can only be achieved if breeders are motivated to address this issue and if they are confident that information they disclose will be treated confidentially. In addition, any information provided, for example, about affected dogs, should be truthful and complete.

2. Improved monitoring of the incidence and prevalence of epilepsy is needed. Identification of the genetic factors associated with epilepsy is pivotal to being able to develop a DNA screening test.

3. Veterinary surgeons should be encouraged to submit blood left over from diagnostic tests to hospitals and institutions that can extract and store DNA with a view to future or existing genetic studies. To enable veterinary surgeons in general practice to do this they must be aware of the need and it must be a simple process, e.g. easy to access and use forms characterising the phenotype, postage paid envelopes and clear instructions.

Heart disease with a known or suspected inherited basis

Dr Joanna Dukes-McEwan

Heart disease in dogs is common and is a major cause of morbidity and mortality. Heart disease may be subdivided into:

- Congenital heart disease; a structural heart defect which the puppy is born with
- Acquired heart diseases; a structural or functional heart defect which can develop in middle or older age.

For most of the congenital heart diseases and the acquired heart diseases, any treatment intervention is palliative (e.g. the treatment of congestive heart failure). With a few exceptions for some congenital heart diseases, the conditions cannot be cured and treatment aims to reduce severity, rate of progression, reduce risk of sudden death or improve quality of life. Therefore, heart disease in dogs is of welfare importance.

There are breed predispositions for most of the congenital and acquired heart diseases. Therefore, it is inferred that there is a genetic predisposition within certain breeds. There is some published evidence supporting the familial nature of particular diseases within a breed, including pedigree and segregation analyses and some diseases in certain breeds have undergone linkage analysis or genome wide association analysis. However, it is becoming clear that some conditions hypothesised to be single gene disorders within a given breed are likely to be more complex than originally considered.

Crossbred dogs may also suffer from certain of the congenital and acquired heart diseases; they are not unique to pedigree dogs although the high incidence in certain breeds is concerning and suggests that the narrow gene pool, founder effect, popular sire or inbreeding in a particular breed may increase incidence in contrast to the general canine population. There is no clear evidence that the Kennel Club breed standards or that external conformation factors play a role in susceptibility to a heart disease. However, there are some general conclusions such as small and

toy breed dogs are more likely to develop congestive heart failure due to myxomatous degenerative valvular disease and that large and giant breed dogs may be more likely to develop dilated cardiomyopathy.

Congenital heart diseases

Patent ductus arteriosus (PDA)

There is significant evidence that this has a genetic basis in certain breeds (for example, Keeshonden, Pembroke Corgis, Toy and Miniature Poodles) although it is also seen in cross-breed dogs (especially German Shepherd Dogs and Border Collies and their crosses). It is more likely to occur in bitches than males and this sex predisposition is not evident in other heart diseases. The *ductus arteriosus* is a normal vessel in the foetus but after birth, it should close. If it does not, there is continuous shunting of blood between the aorta and the pulmonary artery, overloading the lungs and the left side of the heart, which eventually leads in most cases to congestive heart failure. It is very important to diagnose as early as possible since this is one of the few congenital heart defects which may be cured, by open chest surgery or minimally invasive key-hole procedures via catheterization. The outlook for affected dogs is much poorer if the diagnosis is made once they have developed congestive heart failure, or the heart muscle function is adversely affected. Affected puppies have a characteristic continuous murmur and the primary veterinary examination is very important for that puppy and so that the breeders can be advised to avoid breeding the sire and dam together again.

Aortic stenosis

This is one of the most common congenital heart defects in dogs. Either the aortic valve or the area beneath (or above) the valve is narrowed, so flow leaving the left ventricle into the aorta is fast and turbulent (giving a heart murmur) and there is a pressure load on the left ventricle. Although this is a congenital heart disease, lesions can progress after birth, so the heart murmur may increase as the puppy grows. Aortic stenosis is prevalent in certain breeds, especially larger breeds such as the Boxer, Newfoundland, Rottweiler and Golden Retriever. Heart testing schemes, based on cardiac auscultation, have been run by certain breed clubs and breed councils (e.g. The Newfoundland Club, the Boxer Breed Council) in association with the Veterinary Cardiovascular Society. Dogs with louder heart murmurs have the more severe disease. These schemes are successful in that the number of puppies with severe disease presenting to cardiologists have reduced. Because of the progressive nature of the lesions, the official heart testing should be when the dog is mature (12 months old). In some breeds, mild disease may not be detected and so Doppler echocardiography is used, and peak aortic flow velocity recorded (the faster the flow, the worse the stenosis). Dogs with severe aortic stenosis are at risk of exercise intolerance, syncope (fainting) and sudden death. There are no reliable treatment options. In contrast, some dogs may have only mild disease which does not affect their activity level, quality of life or life-span. There is evidence from at least one UK breed (Boxers) that selecting unaffected or mildly affected dogs for breeding by heart testing does reduce the proportion of severely affected dogs. Some dogs in breeds predisposed to aortic stenosis may also have narrower aortic roots than other dogs of similar body size although the significance of this is uncertain (Boxers and Bull Terriers).

Other congenital heart diseases

Pulmonic stenosis is a narrowing of the pulmonic valve, or close to the valve, which obstructs flow leaving the right ventricle going to the pulmonary artery to the lungs. Again, heart murmur grade correlates with severity. This condition can be treated palliatively in certain dogs (balloon valvuloplasty). However, in two brachycephalic breeds, the Bulldog and Boxer, the condition may be associated with abnormalities of the coronary artery which mean that balloon dilation of the obstruction is not possible or is risky. Although there are well defined breed predispositions to pulmonic stenosis, the familial nature and mode of inheritance are unclear. Other commonly affected breeds include Cocker Spaniels, Miniature Schnauzers and Bull Mastiffs. No

official heart testing schemes are currently run. The primary veterinary surgeon examining puppies therefore has an important role.

Mitral and Tricuspid Dysplasia are congenital abnormalities of the mitral and tricuspid valves, usually resulting in incompetence of the valves. There are strong breed associations for both conditions and tricuspid dysplasia has been mapped by linkage analysis to chromosome 9 in the Labrador Retriever. Auscultation is reliable at detecting a heart murmur in mitral dysplasia, but it is less useful in tricuspid dysplasia. Breeds predisposed to mitral dysplasia include Bull Terriers and Great Danes.

Ventricular septal defects (VSD) are less common in dogs than other species, but they can still be associated with specific breeds such as the Cocker Spaniel and West Highland White Terrier. Very little is known about the genetic basis or inheritance of VSD, although there are some known candidate genes.

Acquired heart diseases

Myxomatous degenerative valvular disease (MMVD)

Myxomatous degeneration of heart valves can be regarded as a normal ageing process and the characteristic pathological changes can be recognised in any elderly dog of any breed or crossbreed undergoing post-mortem examination. However, of particular concern is that this process occurs prematurely and progresses faster in small dogs in general. The Cavalier King Charles Spaniel and Dachshunds are examples of predisposed breeds. Although the Cavalier King Charles spaniel may have a premature onset, a more rapid progression than that found in other breeds is not shown. The degenerative changes predominantly affects the mitral valve (so the condition is also known as mitral valve disease), leading it to become incompetent and leaky (mitral regurgitation), giving the characteristic heart murmur. This leads to volume overloading of the heart, and eventually pressures build up in the heart, resulting in damming back in the lungs (pulmonary oedema), leading to the signs of congestive heart failure (e.g. shortness of breath, coughing). Median survival time, even with optimised congestive heart failure treatment, is only 6 months after developing congestive heart failure signs. However, the time period from first detecting the heart murmur until the mitral regurgitation is severe enough to result in congestive heart failure may exceed five years.

For the Cavalier King Charles Spaniel there has been an attempt to address this problem by requiring annual heart testing (stethoscope), and avoiding breeding from dogs or bitches with premature onset of a heart murmur. However, rather than delaying breeding until dogs become elderly, the status of parents are also included prior to breeding. The age of onset does appear to have an inherited basis and a genome wide association study has identified loci within the genome which segregate between the cohort which are premature affected and the cohort with late onset disease.

Dilated cardiomyopathy (DCM)

Dilated cardiomyopathy is an acquired heart muscle disorder, where the heart fails as a pump. Pressures may build up in the heart, leading to fluid coming out of the circulation into the lungs (pulmonary oedema) or in to body cavities (ascites; free fluid in the abdomen, pleural effusion; free fluid in the chest cavity). Affected dogs often show marked exercise intolerance, weight and muscle loss and have severely compromised quality of life. Once congestive heart failure signs develop, even with optimised treatment, survival may only be weeks or months. This condition predominantly affects large and giant breeds of dog such as the Dobermann, Newfoundland, Irish Wolfhound and Great Dane, with some exceptions (Spaniel breeds); it is rare in cross breed dogs. It has long been suspected to have a familial or genetic basis, which has been confirmed in some breeds. In most breeds, inheritance was believed to be autosomal dominant, but there is evidence from breeds such as the Irish Wolfhound that dilated cardiomyopathy is not a single gene disorder.

In some breeds, the cardiomyopathy is associated with abnormal heart rhythms. Atrial fibrillation is an excessively fast heart rate which is common in large and giant breeds with CHF. In some giant breeds, it may precede any clinical signs or onset of congestive heart failure. Ventricular arrhythmias (e.g. ventricular tachycardia) are particularly common in certain breeds and are believed to be associated syncopal (fainting) episodes or even sudden cardiac death (presumed due to ventricular fibrillation). In certain breeds, for example, the Dobermann, sudden death is remarkably common, and it may be the first and only sign of a heart problem. Many experienced owners or breeders of these affected breeds may even regard it as *'normal'* that a dog may drop dead in middle or older age and may never inform their veterinary surgeon or request a post-mortem examination. The genetic basis of dilated cardiomyopathy is under investigation. At least two potential loci have been mapped in the Dobermann (chromosome 5 and 14, with one known gene implicated (PDK4 on chromosome 14). Arrhythmogenic right ventricular cardiomyopathy (ARVC) is another specific form of cardiomyopathy affecting the Boxer. One gene (striatin) has been associated with the disease, but it is probable that there are other genetic causes still to be identified.

Screening for cardiomyopathy is not easy as this is an acquired disease and results of screening tests early on in the dog's life may be completely normal. The disease evolves over years, as serial screening can identify affected dogs eventually, but results can be equivocal during this evolution. Screening includes echocardiography and 24 hour ambulatory ECG recording (Holter monitoring) in breeds at risk of arrhythmias. However, as the disease may not be manifested until the end of a breeding career, such testing does not always prevent transmission of disease to progeny. In the future, genetic testing may be possible, although the genetic heterogeneity so far apparent in Boxers and Dobermanns means that clinical screening may also be required. There is evidence accumulating that medical management of dogs in the preclinical stages of dilated cardiomyopathy (diagnosis made but no clinical signs) can delay the progression into congestive heart failure, so screening benefits the individual dog.

Recommendations

In attempting to address the problem of both congenital and acquired heart diseases in dogs, the following need to be taken into account:

1) The importance of the primary veterinary examination prior to or after purchase of a puppy, so that both the new owner and the breeders can be suitably advised.
2) In breeds with high prevalence of a particular disease, the breed councils/clubs/societies have set up heart testing schemes, in association with the Veterinary Cardiovascular Society. Heart testing by auscultation (use of a stethoscope) can identify most cases of congenital heart disease because of the presence of a heart murmur. One-off testing, as a puppy and once the dog is mature (e.g. 12 months old) identifies significant cases. MMVD can be similarly reliably identified by cardiac auscultation both by the primary veterinary surgeon and by cardiologists. However, this needs to be serially repeated through the dog's life, e.g. annually. Dilated cardiomyopathy may have no auscultatory abnormalities and screening is far more complex and may include echocardiography, ambulatory ECG monitoring and blood testing, for cardiac biomarkers. This is costly and time consuming, especially as it also needs to be serially repeated. There was a move to the Kennel Club/British Veterinary Association taking over the umbrella of heart testing schemes although this has not been concluded so far. It has been difficult to include all breeds and all conditions on one form, and dealing with acquired heart diseases is always going to be problematic because of the need for repeat testing, e.g. annually.
3) There is still a lack of UK specific prevalence data for many of the breed associated problems. If breed clubs or the Kennel Club held records of morbidity/mortality data, true incidence of new cases per year could be monitored and early action taken for new emerging problems or increasing numbers of cases.
4) The significant advances in canine genetics and the fact that dogs have many diseases of comparative importance to humans mean that we should aim to collect pedigree, DNA and

phenotype data from dogs with various conditions and attempt to identify genes implicated with these conditions. If such genetic testing was shown to be reliable, then genetic screening of even acquired heart diseases may be possible and provide the breeder with an important tool in making decisions about breeding.

Breed-related and inherited skin conditions

Dr Janet Littlewood

Whilst there are a number of ***congenital, inherited disorders of the skin*** that have been reported sporadically in the dog, such as aplasia cutis (absence of skin), epidermolysis bullosa (congenital blistering conditions), cutaneous asthenia (Ehlers-Danlos syndrome, hyperextensible skin) and ichthyosis (abnormal scaling), these are generally uncommon to rare. The severe conditions are relatively easily recognised and further dissemination of the condition limited by removal of parents from breeding programmes; animals affected with severe inherited defects do not usually survive to be used for breeding.

A number of ***primary keratinisation defects*** that are not life threatening are recognised in certain breeds, where mildly affected individuals may survive to be used in breeding programmes if the condition is not identified. Some of these ichthyotic conditions may be accompanied by other ocular adnexal abnormalities that may result in significant welfare issues, such as failure of tear production and resulting keratoconjunctivitis sicca, or *'dry eye'*. If abnormalities of skin differentiation and shedding are recognised in a family or line of dogs then removal of affected and closely related dogs from breeding programmes should result in a decline in the prevalence of these conditions.

Breeds which have *excessive* ***skin folds*** as a result of breed standards and type, such as some of the chondrodystrophic dwarfed breeds, brachycephalic breeds and screw-tail breeds, are prone to potentially unpleasant and uncomfortable infections in these fold areas – so called *'intertrigo.'* Overgrowth of commensal yeast and bacterial organisms and opportunistic infections with pathogens may occur and be associated with significant inflammation and exudation. These may, on occasion, be a potential risk to immunocompromised members of the owner's family as a source of large numbers of microbes that might cause an infection. Excessive facial and nasal folds and loose facial skin can also result in ocular damage as well as contributing to respiratory compromise in brachycephalic breeds.

In some breeds, such as the Sharpei, there may be excessive accumulation of connective tissue ground substance, ***mucinosis***, which is also associated with secondary infection as well as a tendency to ooze from the skin surface; often extremely refractory to therapeutic interventions. Many of these intertriginous problems could be limited, or avoided, by not breeding to produce extreme examples of the breed standard.

An extremely troublesome skin condition that runs in families, although the true nature of the heritability of the problem remains unclear, is ***demodicosis***. This condition is characterised by an overgrowth of follicular mange mites. These mites are considered to be commensals, in small numbers, but in young, immature animals the presence of large numbers of mites is associated with clinical signs of alopecia and also a risk of secondary bacterial skin infections (pyoderma). Although localised disease frequently self-cures as pups grow and mature, some cases may be generalised and fail to resolve. Treatment of demodicosis can be challenging, protracted and expensive and not without risk of toxicity to the patient and, depending on the product used, also to personnel involved in treating the patient. In addition, adult onset disease is seen, which is often extremely challenging to manage. It is already an accepted recommendation that any animal that has suffered from demodicosis should never be used for breeding and bitches that have produced affected puppies should also be withdrawn from breeding programmes. It is less clear whether sires of affected puppies should be removed from breeding programmes.

Atopic dermatitis is a common skin condition, which may affect up to 15% of some breeds of dog. Many breeds are predisposed to develop this condition and the tendency to develop allergic

disease is well recognised as running in certain families. Atopic dogs are frequently hypersensitive to allergens similar to those that cause allergic disease in humans, and the prevalence of the disease in dogs may well be increasing in parallel with the increase in prevalence well documented in human patients. Canine atopic dermatitis is the single most common reason for referral to dermatologists and typically this condition comprises around 75% of the referral case load in companion animal dermatology practice. Although there is an environmental component to the disease, there is a strong heritable component, estimated to be 0.47 (with a standard error +/-0.17) in Labrador and Golden Retrievers. The clinical manifestations of atopic dermatitis are quite variable, from mild and not requiring any or only minimal therapeutic intervention, to severe and presenting a significant welfare issue in severely affected individuals and a challenge to both clinicians and owners to manage. It is rare for affected dogs to become naturally tolerant to allergens to which they are sensitised and lifelong treatment is usually required. Secondary infections and secondary otitis externa are common complications and add to the morbidity of affected individuals and can result in life-threatening infections if resistant organisms become involved or, more often, chronic ear problems may develop which can lead to end-stage irreversible changes that require total ear canal ablation – painful and expensive surgery which leaves the dog profoundly deaf.

Dogs suffering from canine atopic dermatitis should not be used for breeding. By removing parents of affected dogs from breeding programmes the prevalence of the disease can be reduced and some success has already been achieved in reducing prevalence amongst Guide Dogs for the Blind. Unfortunately, affected animals may already have been used for breeding before they become clinically affected themselves. By being aware of clinical signs that may be early indicators of a dog potentially developing atopic dermatitis, such as episodes of superficial pyoderma or episodes of otitis externa, it may be possible to avoid breeding from animals that later develop full blown signs of atopic dermatitis.

Recommendations

1. Parents producing puppies with congenital inherited skin problems should be removed from breeding programmes; animals affected with severe congenital inherited defects do not usually survive to breeding age.
2. If abnormalities of skin differentiation and shedding are recognised in a family or line of dogs then removal of affected and closely related dogs from breeding programmes should result in a decline in the prevalence of these conditions.
3. Skin fold and intertrigo problems could be limited, or avoided, by not breeding to produce extreme examples of the breed standard.
4. Any animal that has suffered from demodicosis should never be used for breeding and bitches that have produced affected puppies should also be withdrawn from breeding programmes. The situation with regard to the sires of affected puppies requires clarification.
5. Dogs suffering from canine atopic dermatitis should not be used for breeding. By removing parents of affected dogs from breeding programmes the prevalence of the disease can be reduced. Arguably, the same approach should be considered for animals with early indications of atopic dermatitis.

Limb defects (including hip dysplasia and elbow dysplasia)

Professor John Innes

Introduction

Limb defects are common in certain breeds. Many of these problems become apparent in early life as the developing skeleton grows. Although some of these problems, such as hip dysplasia, have been recognised for some considerable time, it has been challenging to reduce the prevalence of these conditions in breed populations due to the complex nature of the aetiology of such conditions.

Hip dysplasia (HD)

Hip dysplasia is defined as a varying degree of laxity of the hip joint permitting subluxation in early life, giving rise to varying degrees of shallow acetabulum and flattening of the femoral head, and finally inevitably leading to osteoarthritis. The clinical effects of the disorder are variable but dogs can suffer from chronic hip pain from a few months of age. Although the pain may abate as dogs reach maturity, this is not always the case, and often the pain returns as the osteoarthritis progresses to such a point that stiffness, pain and lameness return.

It has been known for several decades that hip dysplasia has an inherited component. Heritability estimates vary both with the method used to measure hip dysplasia and the population under study, but are typically in the range of 0.3-0.5. This has encouraged the use of screening and breeding programmes in many countries including the UK. These schemes are based on the detection of phenotype, typically from one year of age onwards. In the UK, the BVA/KC Hip Scheme assesses radiographic features of canine hips and assigns a score to each dog intended for breeding. Breeding from dogs with lower scores aims to reduce the prevalence of the condition in pedigree dogs. Recently, the use of estimated breeding values (EBVs) aims to increase the rate of reduction in disease prevalence. Despite the efforts of such breeding schemes, the occurrence of hip dysplasia and subsequent osteoarthritis remains high. There are issues with radiographic screening since the position of the dog is not optimal for the detection of hip laxity.

Research into the genetic basis of HD continues and, ultimately, genetic testing for this polygenic trait must be the goal. However, there are still significant challenges in identifying the major genetic factors associated with HD.

Elbow dysplasia (ED)

Elbow dysplasia sounds as if it should be similar to hip dysplasia but, in fact, it is a term for a group of poorly understood developmental disorders that affect growing dogs of mostly medium-large breed dogs. The separate disorders grouped under this term include:

1. ***Osteochondral fragmentation of the medial coronoid process*** (FMCP): This is the most common form of elbow dysplasia and studies suggest that ~97% of young dogs suffering from elbow pain have this form. The aetiology is obscure but the pathology starts with osteochondral fragmentation of the medial coronoid process adjacent to the radial incisure. The disorder inevitably leads to progressive osteoarthritis of the elbow and is usually bilateral. Dogs often present from 5-9 months of age and, although the pain may diminish, even disappear, as dogs reach maturity, this is not always the case, and often the pain returns as the osteoarthritis progresses to such a point that stiffness, pain and lameness return. The range of breed types affected appears narrower compared with hip dysplasia.

Again, there is an inherited component to this disorder with heritabilities in the range of ~0.3-0.7. Radiographic screening programmes have also been introduced, but are of more recent origin than those for HD. The challenge with FMCP is that the primary lesion is almost never visible on radiographs and thus the radiologists rely on the secondary signs of osteoarthritis to indicate the presence of the disorder. There can be significant delay in these signs appearing and this delay can occur at a critical time for breeders (1-2 years of age) meaning that dogs screened at one year of age may have the disorder but not show the phenotype on the radiograph.

A genetic correlation between HD and ED has been identified.

2. ***Ununited anconeal process*** *(UAP)*: This form of ED involves a failure of the anconeal process to unite to the olecranon in the developing elbow. It is an uncommon form of ED.

3. ***Osteochondritis dissecans of the medial humeral condyle*** (OCD): Again, this is an uncommon form of ED and involves the appearance of a loose flap of cartilage on the articular surface of the humerus.

4. ***Elbow incongruity***: This is a very poorly defined condition because the limits of normality for elbow congruity have not been defined. It is therefore a subjective assessment of elbow conformation and the *"goodness"* of fit between the articulating surfaces. However, plain radiographs are problematic when defining such relationships and further investigations with advanced imaging modalities such as computed tomography (CT) will be necessary to define the condition acceptably.

Incomplete ossification of the humeral condyle (IOHC)

This is a relatively recently described condition but one perhaps seen with increasing frequency. It also occurs as a developmental abnormality of the distal humerus and so, arguably, could be lumped in with other conditions known as ED. In the UK, the condition is almost exclusively confined to Spaniels. It causes a predisposition to fracture of the humeral condyle but may also cause pain and lameness in the prodromal stage. Heritability studies are lacking but the restricted breed distribution suggests an inherited component.

Growth deformities of the antebrachium

Some degree of deformity of the antebrachium is standard for certain breeds of dog. These are generally classified as chondrodystrophic breeds and include Basset Hounds, Dachshunds Terriers, Spaniels etc. The so-called *'Queen Anne legs'* represent this conformation. Whilst in most dogs this does not lead to pathology, when the feature is exaggerated, there can be associated subluxation of the elbow or carpus leading to pain and lameness and secondary osteoarthritis.

Cranial cruciate ligament rupture (CCLR)

This is perhaps the *'elephant in the room.'* Cruciate ligament rupture is an extremely common orthopaedic condition in dogs. In 2003, it was estimated that the US dog-owning population spent a staggering $1.3 billion on veterinary care for their pets with this condition. It is common across a range of breeds but tends to occur in middle-age. Affected dogs have pain and lameness and there is progressive osteoarthritis which tends to decrease mobility over a 3-5 year period. Surgical treatment is generally recommended for medium-large breed dogs, hence the large healthcare costs. Recent cohort studies indicate that 54% of affected dogs rupture the contralateral CCL at a median interval of 2.6 years.

Epidemiological data indicate breed predispositions for CCLR and there are more recent data which indicate an inherited component. There are no screening programmes for CCLR because there are no phenotypic markers that indicate disease until the CCL ruptures, which may be later in life (beyond the time of breeding). There are ongoing studies in UK and USA to identify genetic associations in certain breeds with CCLR.

Summary

Orthopaedic conditions (limb defects) are common in dogs. Often these are disorders that start during skeletal development and can therefore cause pain and lameness from a young age. Many of these conditions can be bilateral, and such symmetry can limit the appearance of clinical signs because lameness may be less obvious for bilateral problems compared to unilateral pain. The expenditure on treatment of these conditions is considerable and thus the welfare implications are clear. For example, the annual spend on NSAIDs for chronic musculoskeletal pain in dogs in the developed world is ~350 million.

Recommendations

1. Maximum use of established screening programmes for HD and ED is to be encouraged. In addition, optimum use of such data is essential if progress is to be made with reduction in

frequency of disease. The cost-benefit of such schemes should be kept under constant review.

2. There should be continued efforts to identify genetic associations with these common disorders such that phenotypic screening programmes may be phased out in favour of more effective, more cost-efficient genetic tests.

3. Further data on the physiological consequences of varied skeletal conformation should be pursued such that safety limits for skeletal conformation might be developed.

Addendum

Responsible dog breeding not only involves the selection of appropriate animals to ensure the physical welfare of offspring, but the provision of a suitable early environment. This is important in ensuring that the behavioural development of puppies results in adult dogs suitable for living in a domestic environment. Inadequate early environment can result in a number of different physical and behavioural problems, which can have profound effects on the welfare of dogs throughout their lives and impact on the success of dog-owner bonds. It is clear that modern life styles do not always sit easily with the responsibilities of dog ownership and the Advisory Council was unanimous in adding *'separation related behaviour'* to the priority problems, as this is a common problem with considerable welfare implications and one that arises predominantly as a result of early life experiences. This is the first of what will be key contributions considering environmental aspects of dog breeding that are of crucial importance in relation to disease, health, welfare and behaviour.

Separation related behaviour: a serious but often hidden welfare issue for domestic dogs

Dr Rachel Casey

What is separation related behaviour?

Separation related behaviours are sometimes known as *'home alone'* or *'owner absent'* behaviours, and describe the range of undesired behaviours which dogs may show when left alone in the house by their owners. This might include howling, barking, destruction or toileting. Dogs usually show these behaviours soon after they are left.

Separation related behaviour (SRB) is a very common problem in the dog population: for example a longitudinal study of Labrador Retrievers and Border Collies, found that over 50% of dogs had displayed SRB by 18 months of age. Questionnaire surveys of dog walkers carried out in different locations in Southern England revealed that 13% of dogs from the general population were currently exhibiting SRB and a further 11% had done so at some time in the past.

Why do these behaviours develop?

'Separation related behaviour' is a descriptive term: it groups together all undesired behaviours which occur when dogs are left alone. However, not all dogs show these behaviours for the same reason. For example, some dogs may be destructive when owners are out because they are inhibited from playing and chewing when their owners are present, because of punishment. These behaviours may also arise where dogs anticipate an aversive event, because something has previously happened whilst their owners were out (e.g. a loud noise) and they have associated this with being alone. However, the majority of dogs develop these behaviours as a result of not learning to cope with social isolation whilst puppies, resulting in anxiety when left alone throughout life.

Why is this issue relevant to dog breeding?

The Advisory Council is highlighting this problem because it is common, generally arises due to early experiences, and significantly compromises the welfare of dogs over long periods. Prevention of the problem lies in adequate habituation of puppies early in life to separation from people.

Why are these behaviours so common?

The dog has changed significantly from its ancestral species, behaviourally as well as physically, over the process of domestication. This means that many of the *'traditional'* interpretations of dog behaviour based on models of wolf behaviour are no longer considered applicable. However, dogs have retained a fundamental characteristic of the wolf; their highly social nature. It is normal for dogs to spend their time with other dogs, engaging in social activities, and it is not a natural occurrence for members of the species to be socially isolated.

When isolated, puppies will naturally show behaviours in order to regain social contact, such as vocalising or trying to escape. These behaviours are motivated by anxiety about being separated from their mother, siblings or human family and can continue for a long time. Behaviours which are *'successful'* in preventing owners leaving, or getting them to return become reinforced: in other words they are more likely to be used by the animal again the next time it is in the same situation. For example, if a puppy barks when it is first left alone, and the owner returns, the puppy is more likely to bark next time, because this previously worked to ameliorate its distress. With repetition, this behaviour can become established such that dog may bark for prolonged periods whilst owners are out – eventually the behaviour *'works'* for the dog when owners return.

Because returning to puppies reinforces behavioural responses which are undesired, it has previously been suggested that puppies should be left alone and ignored if they show signs of distress. However, this approach is no longer recommended as it can lead to prolonged periods of distress for puppies. These puppies may remain anxious throughout life when left alone, even though they do not show any *'problem'* behaviour for their owner, such as destruction or vocalisation. Indeed, although undesired responses such as barking and destruction are common in dogs, even more dogs are distressed when left alone but do not show *'problem'* behaviours. Rather, these show more subtle signs of anxiety, such as pacing, restlessness or repetitive behaviours, which the owners may not recognise or seek help for.

Recommendations

1. The risk of separation related behaviours can be substantially reduced by starting the process of habituating puppies to social isolation in the breeder's environment. This should be achieved by a programme of initially momentary separation of each puppy from its mother and litter mates in the presence of people, building up to gradually longer periods of separation from other dogs, and ultimately brief separation from dogs and people. Such programmes prepare puppies for experiencing separation from littermates when homed, and start habituating them to cope with the periods of complete social isolation which are a common element of domestic life for dogs.
2. On homing, owners are encouraged to gradually accustom their new puppy to social isolation. This may be achieved, for example, by gradually moving the location where the puppy sleeps away from owners, such that the puppy does not become anxious in this situation.
3. Further research is required to understand the extent to which anxiety associated behaviours are influenced by genetic factors, and the Advisory Council suggests that research is needed into the identification of characteristics which influence behavioural styles and potential genetic markers, for these are important in selecting dogs best suited for the domestic environment.
4. Owners need to be aware that dogs showing separation related behaviours are distressed, rather than *'naughty'* or *'dirty.'* These behaviours can be successfully treated, and owners should seek advice from a qualified behaviourist* when they see signs of separation behaviours.

*Veterinary Behaviourists or Clinical Animal Behaviourists as defined by the Animal Behaviour and Training Council (ABTCouncil.org.uk) have standards of qualification and experience for animal behaviour modification,

Second Advisory Council Report and Recommendations on priority welfare conditions

GLAUCOMA

Mrs Beverley Cottrell and Professor Sheila Crispin

INTRODUCTION AND OVERVIEW

The term glaucoma describes a group of diseases of the eye which can lead to pain and loss of vision. The glaucomas are characterised by an increase in intra-ocular pressure and damage to nerve fibres (those of the retina and optic nerve). It is the increase in pressure which causes pain and a progressive - and often very rapid - degeneration of the nerves resulting in visual loss. Intra-ocular pressure increases when the rate of drainage of aqueous from the eye fails to match the rate of its production.

The glaucomas are classified as either primary or secondary. Primary glaucomas are hereditary, and result from anatomical or physiological abnormalities which cause a decrease in the rate of drainage of aqueous from the eye. The primary glaucomas are sub-divided into angle closure and open angle glaucoma. The first is characterised by an anatomical abnormality of the drainage angle, specifically that part of the outflow apparatus called the pectinate ligament (this anatomical abnormality is termed *goniodysgenesis*) and the second is characterised by a physiological resistance to aqueous outflow. The first is the more common type in the dog and the abnormality can be viewed by performing gonioscopy or detected using high frequency ultrasound. The second cannot be detected in these ways and requires the use of more sophisticated diagnostic equipment. In the dog, the second type is extremely rare, although in humans it is the more common type. There is a further type of primary glaucoma in the dog associated with pigment dispersion (or diffuse ocular melanosis), which is seen in Cairn Terriers and Labrador Retrievers. This type can be detected by gonioscopy and is suspected to be hereditary, although the precise nature of inheritance has yet to be characterised.

Secondary glaucomas result from other abnormalities in the eye which decrease the drainage of aqueous, such as tumours, which obstruct the drainage angle, or lens luxation, where the lens becomes displaced from its normal position and interferes with the normal outflow of aqueous. Lens luxation may be secondary to glaucoma, particularly when the globe enlarges, or it may be a primary inherited condition (primary lens luxation) in which secondary glaucoma is a common sequel. Uveitis and trauma can also result in the development of secondary glaucoma.

The clinical signs of glaucoma may be subtle, but involve some or all of the following: cloudy cornea (corneal oedema), fixed and dilated pupil, scleral congestion (the eye will be reddened), cupped optic disc, pain and loss of vision. In both primary angle closure glaucoma and glaucoma secondary to primary lens luxation, both eyes are generally affected, but not necessarily at the same time. Intra-ocular pressure can be measured by several methods and any pressure measurement of over 22mmHg, in conjunction with ocular signs, may give rise to a diagnosis of glaucoma.

It is important to understand that an anatomical abnormality can exist in the absence of clinical signs of glaucoma. The anatomical abnormality is not a diagnosis of glaucoma – it is a pointer towards the likelihood of the development of glaucoma at some point in the future. Not all dogs with an anatomical abnormality will develop glaucoma. Conversely, dogs which have an apparently normal drainage angle on gonioscopic examination *may* develop glaucoma at some later date. There are age related changes in the drainage angle which need to be better characterised and understood, and it is clear that no categorical assurances can be given either way following gonioscopy.

CLINICAL SIGNIFICANCE

There are various surgical and medical regimes for the treatment of glaucoma, none of which is entirely satisfactory, and the condition remains a frustrating one to treat. In most cases vision is lost

and the affected painful eye will require removal; if both eyes are blind and painful the owner's decision is rendered even more difficult. As glaucoma is a condition which causes pain and blindness, it follows that any reduction in its occurrence is to be encouraged. Given that primary glaucoma is a bilateral problem which is inherited in many breeds, early screening and ensuring that affected dogs are not used in breeding programmes will, in the longer term, reduce the incidence of glaucoma in a particular breed.

GENETICS

The majority of inherited **primary glaucomas** are thought to be polygenic, and are not inherited in the simple Mendelian fashion which characterises some other inherited ocular diseases (such as some hereditary cataracts in some breeds, and a number of the progressive retinal atrophies). However, an open angle glaucoma in Beagles, with onset at 6 to 18 months of age is autosomal recessive. Mapping the genetic defect led to the identification of a region containing several genes that segregates consistently with glaucoma. Of these a gene (ADAMTS10) that is mutated in glaucomatous dogs is a good candidate as the causative mutation and has been seen mutated both in a colony of glaucomatous Beagles and in pet Beagles. A DNA test has been launched by Optigen[1,2]. Glaucoma associated with ocular melanosis in the Cairn terrier appears to segregate as single autosomal dominant locus, although the actual gene involved has not yet been identified[3]. Preliminary evidence indicates primary open angle glaucoma in the Petit Bassett Griffon Vendeen may have an autosomal recessive mode of inheritance, but these breeds are exceptions to the complex nature of glaucoma in most breeds. Because of this little progress has been made towards the development of DNA tests for primary inherited glaucomas, and clinical examination remains the best option, in spite of its imperfections and the difficulties associated with interpretation of the abnormalities seen. The affected breeds are shown in Table 1, along with the possible mode of inheritance.

Primary lens luxation is a cause of **secondary glaucoma** and is inherited as a simple recessive trait and the breeds affected are summarised in Table 2.

RECOMMENDATIONS

The polygenic nature of **primary glaucoma** in most breeds makes it difficult to predict whether the offspring of an affected dog will itself be affected, and if so, to what extent. Nevertheless, the condition has moderate or high heritability, so that affected dogs should not be bred from, as this will reduce future disease incidence. Goniodysgenesis is a congenital/neonatal condition and therefore can be diagnosed early. Dogs can be presented for examination from the age of 6 months, so long as the eye is large enough to accommodate the goniolens. Some studies have shown a narrowing of the angle and progression of pectinate ligament dysplasia with age[4] and it would be useful for research purposes if owners continued to present their older dogs which have passed earlier tests, so that ageing changes may be monitored and appropriate advice given.

TABLE 1

BREED (Schedule A BVA/KC/ISDS Eye Scheme)	TYPE OF INHERITANCE	AGE OF ONSET OF GLAUCOMA
Basset Hound	Unknown, possibly polygenic	Variable, most common in 5-7 year olds
Japanese Shiba Inu	Unknown	5-11 years old at presentation
Retriever (Flat Coated)	Unknown, familial	Around 5 years
Siberian Husky	Unknown	Variable

Spaniel (American Cocker)	Unknown, but female to male ratio 3:1	Variable, 3-9 years, average 6 years
Spaniel (Cocker)	Unknown	Variable, usually middle age
Spaniel (English Springer)	Unknown, familial.	3-12 years at presentation
Spaniel (Welsh Springer)	Probably autosomal dominant, female to male ratio >2:1	Variable, 10 weeks to 10 years, but skewed towards younger dog (>3 years)
Spanish Water Dog	Unknown	Unknown

The inheritance of glaucoma is also under investigation (Schedule B BVA/KC/ISDS Eye Scheme) in the following breeds: Border Collie, Dandie Dinmont Terrier, Great Dane; Hungarian Vizsla, Leonberger, Retriever (Golden) and Welsh Terrier.

In most breeds with **inherited primary lens luxation** a DNA test is available that assays for a recessive mutation in the *ADAMTS17* gene. The identical mutation has been identified in PLL-affected dogs of 17 breeds and may be shared by additional, closely related breeds. The breeds that are known to segregate the *ADAMTS17* mutation are as follows: Australian Cattle Dog, Chinese Crested, Jack Russell Terrier, Jagdterrier, Lancashire Heeler, Miniature Bull Terrier, Parson Russell Terrier, Patterdale Terrier, Rat Terrier, Sealyham Terrier, Tenterfield Terrier, Tibetan Terrier, Toy Fox Terrier, Volpino Italiano, Welsh Terrier, Wire-Haired Fox Terrier and Yorkshire Terrier. It should be noted that not all these breeds are listed for certification on either Schedule A or B of the BVA/KC/ISDS Eye Scheme. Ophthalmic examination does not always reveal the condition, as its diagnosis depends upon the presence of degeneration - which may be only partial - of the suspensory ligament of the lens, the structure which holds the lens securely in place within the eye. For this reason, the advice of the Eye Scheme is that dogs are presented annually, as regular examination affords the best possibility of early diagnosis and the avoidance of irreversible changes secondary to complete luxation.

TABLE 2

BREED (Schedule A BVA/KC/ISDS Eye Scheme)	MUTATION	DNA TEST
Border Collie	Unknown	
Bull Terrier (Miniature)	ADAMTS17 mutation	Available from Animal Health Trust (www.aht.org.uk)
Fox Terrier (Smooth)	Unknown	
Fox Terrier (Wire)	Unknown	
Lancashire Heeler	ADAMTS17 mutation	Available from Animal Health Trust (www.aht.org.uk)
Parson Russell Terrier	ADAMTS17 mutation	Available from Animal Health Trust (www.aht.org.uk)
Sealyham Terrier	ADAMTS17 mutation	Available from Animal Health Trust (www.aht.org.uk)
Tibetan Terrier	ADAMTS17 mutation	Available from Animal Health Trust (www.aht.org.uk)

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INHERITED NEUROLOGIC DISEASE

Dr Clare Rusbridge

INTRODUCTION

There are broadly speaking three types of inherited neurological disease - simple, complex and inherited susceptibility to immune mediated disease.

Neurological diseases with a simple inheritance

Neurological diseases with a simple Mendelian inheritance are usually due to a single mutation resulting in a defunct or malfunctioning protein essential for normal cell metabolism; they are examples of inborn errors of metabolism. The disease phenotype can be correlated to the genotype. Recessive inheritance is typical and examples include storage diseases such as Neuronal ceroid lipofuscinoses, Fucosidosis and Lafora's disease and metabolic disorders such as L-2 hydroxyglutaric aciduria and hypokalemic myopathy. If DNA from a group of affected and unaffected animals is available, identifying these mutations is comparatively simple, especially with today's advanced molecular biological techniques. Consequently there is an exponential growth in disease gene identification and dedicated laboratories offering DNA testing (Table 1)

TABLE 1

Inherited neurological disease for which there is a DNA test and/or breed screening programme

Disease	Breed	Test	Other information Testing laboratory
Alaskan Husky Encephalopathy	Alaskan Husky	DNA (mouth swabs)	UC Davis
Benign Familial Juvenile Epilepsy	Lagotto Romagnolo	DNA (blood, mouth swabs)	Optigen
Centronuclear Myopathy (Heritary	Labrador Retriever	DNA (mouth swabs)	Animal Health Trust (www.aht.org.uk) Laboklin, Alfont University

Myopathy)			
Cerebellar Ataxia	Italian Spinone#	DNA (mouth swabs)	Animal Health Trust (www.aht.org.uk)
Chiari-like malformation and syringomyelia	Toy breeds and crosses, especially Cavalier King Charles Spaniel#, Griffon Bruxellois, Affenpinscher, Yorkshire Terrier, Pomeranian, Chihuahua	KC BVA Health scheme	http://www.veterinary-neurologist.co.uk/Syringomyelia/BVA-kc-2/ http://www.bva.co.uk/canine_health_schemes/2737.aspx
Deafness (hereditary various causes)	Many breeds, including Australian Shepherd#, Bull Terrier#, Dalmatian#	BAER (brain stem auditory) evoked response)	http://www.aht.org.uk/cms-display/sa_deafness.html
Degenerative Myelopathy (CDRM)	Many breeds, especially American Eskimo Dog, Bernese Mountain Dog, Borzoi, Boxer, Cardigan Welsh Corgi, Cavalier King Charles Spaniel, Chesapeake Bay Retriever, German Shepherd Dog, Golden Retriever, Great Pyrenees, Kerry Blue Terrier, Pembroke Welsh Corgi, Poodle, Pug, Rhodesian Ridgeback, Shetland Sheepdog, Soft Coated Wheaten Terrier, Wire Fox Terrier	DNA (blood, mouth swabs)	University of Missouri Laboklin (Europe)
Episodic Collapse	Cavalier King Charles Spaniel	DNA mouth swabs	Animal Health Trust (www.aht.org.uk)
		DNA blood, mouth swabs	Laboklin
Exercise Induced Collapse (EIC)	Labrador Retriever, Chesapeake Bay Retriever, Curly Coated Retriever, German Wirehaired Pointer, Pembroke Welsh Corgi, Boykin Spaniel	DNA (mouth swabs)	University of Minnesota Laboklin (Europe)
Fucosidosis	English Springer Spaniel	DNA (mouth swabs)	Animal Health Trust (www.aht.org.uk)
		Blood, mouth swabs	Laboklin
GM_1 Gangliosidosis	Alaskan Husky	DNA (blood, mouth swabs)	Laboklin
GM_2 Gangliosidosis	Japanese Chin	DNA (blood, mouth swabs)	University of Missouri
Globoid Cell Leukodystrophy (Krabbe Disease)	Cairn Terrier, West Highland White Terrier	DNA (blood, mouth swabs)	Laboklin

Glycogen Storage Disease (GSDIIIa)	Curly Coated Retriever	DNA (blood, mouth swabs)	Laboklin
L-2 Hydroxyglutaric aciduria	Staffordshire Bull terrier	DNA (mouth swabs)	Animal Health Trust (www.aht.org.uk) Laboklin
Lafora's disease	Miniature Wirehaired Dachshund#, Bassett Hound	DNA (blood, mouth swabs)	http://www.veterinary-neurologist.co.uk/Laforas_disease/
Late onset ataxia	Parson Russell Terrier	DNA (mouth swabs)	Animal Health Trust (www.aht.org.uk)
Leonberger Polyneuropathy	Leonberger	DNA (blood, mouth swabs)	University of Minnesota, University of Bern
Malignant Hyperthermia	All breeds	DNA (blood, mouth swabs)	Laboklin
Mucopolysaccharidosis type VII	German Shepherd	DNA (blood, mouth swabs)	Laboklin
Muscular Dystrophy	Golden Retriever	DNA (blood, mouth swabs)	Laboklin
Myostatin Deficiency (*'Bully'* Whippet)/ Double Muscling	Whippet	DNA (blood, mouth swabs)	Laboklin
Myotonia congenita	Miniature Schnauzer	DNA (blood, mouth swabs)	Laboklin
Narcolepsy	Dobermann, Labrador Retriever, Dachshund	DNA (blood)	Antagene, Optigen, Laboklin
Neonatal Cerebellar Cortical Degeneration	Beagle	DNA (mouth swabs)	Animal Health Trust (www.aht.org.uk)
Neonatal ataxia	Coton de Tuléar		Antagene
Neonatal encephalopathy with seizures	Standard Poodle	DNA (blood, mouth swabs)	University of Missouri Laboklin
Neuronal ceroid lipofusionosis	Tibetan Terrier	DNA (mouth swabs)	Animal Health Trust (www.aht.org.uk) University of Missouri Laboklin
	American Staffordshire Bull Terrier, American Pit Bull Terrier	DNA (blood, mouth swabs)	Antagene
	American Bulldog		University of Missouri Laboklin
	Border Collie, Dachshund, Miniature Long Haired Dachshund, Miniature Smooth Haired Dachshund, Australian		Laboklin

	Shepherd, English Setter		
Pyruvate Dehydrogenase Phosphate 1 Deficiency (PDP1)	Sussex Spaniel, Clumber Spaniel	DNA (mouth swabs)	Animal Health Trust (www.aht.org.uk) Laboklin
Polyneuropathy, neuropathy	Greyhound	DNA (blood, mouth swabs)	Optigen, Laboklin
Pug Dog Encephalitis	Pug	Mouth swab	UC Davis
Spinal Muscular Atrophy	Maine Coon	DNA (blood, mouth swabs)	Antagene
Startle Disease (SD) / Hyperekplexia	Irish Wolfhound	DNA (blood, mouth swabs)	Laboklin

Animal Health Trust http://www.aht.org.uk/cms-display/genetics_tests.html
Antagene http://www.antagene.com/index.motsclefs.Vets-.rubrique_id.185.coderub1.3.coderub2.0.html.coderub2.0.html
Laboklin http://www.laboklin.co.uk/laboklin/showGeneticTest.jsp?testID=8227D
Langford Veterinary Services http://www.langfordvets.co.uk/lab_pcr_tests.htm#gen
Optigen http://www.optigen.com/opt9_test.html
University of Missouri / Orthopaedic Foundation for Animals
http://www.offa.org/dnatesting/dm.html
University of Minnesota
http://www.vdl.umn.edu/ourservices/canineneuromuscular/canineneuro/home.html
UC Davis http://www.vgl.ucdavis.edu/services/PDE.php

Testing recommended, **but not required**, for the Kennel Club Assured Breeder Scheme

Neurological diseases with a complex inheritance

In contrast with simple genetic defects, identifying the disease genes of more complex inherited neurological diseases has been considerably more difficult. These diseases are often a greater welfare issue in terms of numbers of animals affected and impact on quality of life. The disease phenotype may not be correlated to the genotype and if the disease is expressed late in life, or not at all, it may be very difficult for breeders to eliminate the disease from their lines. The inherited neurological diseases with the greatest impact are idiopathic (or genetic) epilepsy and diseases associated with changes in conformation, such as Chiari-like malformation with syringomyelia, caudal cervical spondylomyelopathy, spinal deformity from hemivertebrae and intervertebral disc disease associated with chondrodystrophism. More than one gene is likely to be involved in the inheritance of these diseases, although there may be one gene that has a significant effect. They may be influenced by environmental factors and/or other genetic factors which influence severity, or at what age the disease is expressed, if at all. For example, in the case of idiopathic epilepsy certain genes may determine whether or not a dog is likely to be epileptic and what type of seizures may be observed. Other genes might influence the age of onset of the epilepsy and how severe it is. Certain genes may code for blood-brain barrier proteins which influence how drugs are transported or expelled from the nervous system. Overexpression of these proteins is associated with refractory epilepsy i.e. other genetic factors will influence whether or not an epileptic dog is responsive to medication.

Determining the causative genes in more complex diseases has been more difficult than anticipated. Part of the problem is that it is very difficult to find a control group of animals. For example, the age of onset of epilepsy in the Belgian Shepherd ranges from 0.5 to 8 years and

therefore a good control group could only be obtained by selecting older animals with no seizure history. This means that the owner/breeder integrity, knowledge of the outcome of the puppies and willingness to participate in the programme is crucial. In addition, confirming the diagnosis can be inaccurate since idiopathic (genetic) epilepsy does not have a definitive diagnostic test and the diagnosis is made based on an appropriate history, typical clinical signs and absence of other diagnostic test findings such as MRI and CSF analysis.

Genetic susceptibility to neurological and neuromuscular immune-mediated disease

The third category of inherited neurological disease is a genetic susceptibility to immune-mediated disease. For example, an inherited tendency for polymyositis has been recognised in the Hungarian Vizsla, myasthenia gravis in Newfoundlands, steroid-responsive meningitis-arteritis in Weimaraners, and encephalitis in Yorkshire Terriers and Pugs. Immune-mediated diseases have been associated with variants for major histocompatibility complex (MHC) - in the dog referred to as the dog leukocyte antigen (DLA). The MHC/DLA molecules control the immune system's recognition of self and non-self. Genes within the MHC are unusual because they are highly polymorphic, meaning that there are many variations. This degree of variation may help survival against infectious diseases. Studies in mice have shown that females given a choice show significant preference for mates with dissimilar MHCs, meaning that their offspring may have a more flexible immune system. However in the dog, selective inbreeding has led to a restriction of DLA haplotypes in many breeds which in turn influences susceptibility to infectious diseases and also to immune mediated conditions. Recent research has revealed that a Pug's susceptibility to necrotising encephalomyelitis is associated with the DLA class II genes and in the Hungarian Vizsla a DLA class II haplotype is associated with development of polymyositis.

Recommendations involving the veterinary profession

How can veterinary surgeons help to prevent inherited disease? The veterinary surgeon should be a source of information to breeders, whether the breeder is experienced of inexperienced. If involved as an actual or potential breeder's veterinary surgeon, then it is advisable to be familiar with those diseases the breeder should be screening for.

Veterinary surgeons should also advise breeders to use a Puppy Contract (http://puppycontract.rspca.org.uk/home) and can also help by submitting surplus blood from diagnostic tests to those collecting DNA

(e.g. http://www.liv.ac.uk/dna_archive_for_companion_animals/disease.htm).

For example, when monitoring the epileptic patient it is common to take blood for evaluating organ function and concentration of antiepileptic drugs. If there is surplus blood in EDTA then this could be submitted to the many places that are investigating epilepsy with the ultimate aim of creating a DNA test (e.g. http://www.veterinary-neurologist.co.uk/Library/).

The veterinary profession as a whole should speak out more strongly against some of breeding practices which encourage the proliferation of inherited diseases. For example, maverick stud dogs, otherwise known as the *'popular sire syndrome.'* If a male dog has performed well in the show ring there is a natural inclination for other breeders to wish to use him at stud. However overuse can lead to widespread dissemination of his DNA making it impossible to avoid his DNA in future generations. Some might argue that if a dog is known to be healthy it is better to overuse him than to encourage the use of an unhealthy sire. However, no animal has perfect DNA. The Kennel Club Mate Select programme may help discourage overuse, but in Scandinavian countries the number of offspring a dog has is limited to no more than 5% of registrations of the breed over a five-year period. Another breeding practice which can encourage disease is the '*more is better'* philosophy, for instance, to improve success in the show ring, breeders may select for more extreme variations of the breed standard which may predispose to disease and discomfort. Compared to some 30 years ago many brachycephalic breeds have shorter muzzles with a more domed skull and *'larger'* (i.e. more exposed because of their prominence) eyes that are wider apart giving the dog a more appealing expression. There are disturbing similarities between the appearance of some

brachycephalic toy breeds and descriptions of human craniosynostosis syndromes (premature skull suture fusion) associated with Chiari-type malformation. For example, a person with Crouzon syndrome with Chiari malformation may have a brachycephalic skull, low-set ears, exophthalmos and a hypertelorism (a greater than normal distance between the eyes) and Crouzon syndrome is also characterised by a hypoplastic maxilla leading to an undershot jaw and psittichorhina, or a beak-like nose. Clearly, it is important to avoid breed standards in dogs that can cause health and welfare problems.

CANCERS IN PEDIGREE DOGS

Dr David Sargan

INTRODUCTION AND GENETIC BACKGROUND

For dogs, as for humans, cancers are one of the most important causes of both death and ill health. In the developed world something like one third of all dogs encounter cancer in their lifetime and in the Kennel Club's breed health surveys of 2004, 27% of all deaths recorded (across all breeds) were attributed to cancer. Before those deaths, dogs may well undergo considerable periods of suffering. Treatments such as radical surgery to remove tumours, or radiotherapy or chemotherapy cannot be explained to the patient, are for the owner to provide consent and so have the potential to cause distress to the patient and pose considerable dilemmas for owner and veterinary surgeon alike.

Unfortunately, in terms of understanding cancer, the triggers for imbalance between cell proliferation and cell death and the routes that lead from these initial triggers to the manifestation and survival of a tumour, are highly varied and usually complex. The triggers include environmental effects on the genome such as those of chemical mutagens, sunlight (UVB irradiation) and other radiations in damaging DNA; the effects of some viruses in disrupting the host genome or mimicking host genes involved with cell proliferation and its control; and also problems triggered by host intrinsic factors such as repeated growth, inflammatory or wound healing stimuli.

Names of cancers: Names for different cancers derive in large part from the tissue and/or type of the cells from which the tumour originates. So a carcinoma is a tumour of epithelial cells (the skin and the lining cells of the gut, and other hollow structures of the body); an adenocarcinoma is a malignant tumour of any of the glandular structures of the epithelium; whilst a sarcoma is a tumour of the connective tissue or of bone, cartilage, fat, muscle, vascular or hematopoietic tissues. But a carcinoma might be further defined by its originating tissue as a mammary cancer or a lung cancer for example, whilst a sarcoma might be an osteosarcoma (bone cancer) or a lymphoma (tumour of immune cells).

Breed Associations in Cancer

None of the causes just listed would be expected to be breed associated, and yet various dog breeds seem to have predispositions to particular tumour types (see Table 1). This shows that an animal's genetic inheritance also plays a role in determining whether it is more or less prone to particular types of cancer.

For several breeds associations with particular types of cancer are marked, and well known.

Osteosarcoma (bone cancer): In the giant breeds such as Great Dane, Irish Wolfhound and Saint Bernard more than 10% of all breed mortality may occur from this tumour. Other breeds in Table 2 show lower, but still marked, predisposition. But over the whole dog population annual incidence is only about eight times that in humans (at 7.9/100,000). Canine osteosarcoma is similar to human osteosarcoma in sites of occurrence (>75% in the appendicular skeleton, often in a metaphyseal location). In people, the tumour shows highest incidence during the adolescent growth spurt. In dogs the tumour is most common in giant breeds, and in at least one study, prevalence is

associated with height and to a lesser extent weight, although highest incidence occurs later in life than is the case for the human cancer (Ru *et al*., 1998). Treatment often involves radical surgery such as amputation and life expectancy post-surgery is measured in months, as metastatic spread of the tumour to lungs or other vital organs is common.

Histiocytic sarcomas: Histiocytes are cells whose function is to present foreign objects in the body to the immune system and to activate the immune system; consequently these cells are found throughout the body. Tumours of these cells are rare in people and considerably less rare in dogs, but only reach high prevalence in a few breeds including the Bernese Mountain Dog, the Flat Coated Retriever, the Rottweiler and Golden Retriever (see Table 2 and associated references). In all of these breeds sarcomas of unknown origin located in soft tissues are also more common than in other breeds. In the Bernese Mountain Dog and Flat-Coated Retriever at least one death in six may be due to histiocytic or other soft tissue sarcomas and more than half of all cancers in these breeds are of this type. Histiocytic cancers may be fifty or more times higher in these breeds than in the general dog population. Recently it has been shown that tumours of this type may be associated with inheritance of a genetic variant in the region of two tumour suppressor genes, CDKN2A and CDKN2B, although the actual mutation has not yet been identified.

Histiocytic sarcomas take two forms; a localised form found either just below the skin or embedded in deep muscle sites in the limbs is the most frequent type found in Flat-Coated Retrievers and metastasis is often to local lymph nodes. Such cases were previously referred to as suffering from Malignant Fibrous Histiocytosis. In the Bernese Mountain Dog, a disseminated form of the tumour affects the viscera and particularly the spleen, lungs and liver, as well as causing nodular or ulcerated cutaneous lesions (Affolter and Moore, 2002; Morris *et al.*, 2000, 2002; Abadie *et al.*, 2009). The disseminated form may also be seen in Flat-Coated Retrievers, although less commonly than the localised form. Treatment may use a mixture of surgical, radiotherapeutic and chemotherapeutic approaches. Typically these tumours develop from the age of about six to nine years, but they may be earlier or later. Median survival times for localised histiocytic tumours are typically less than a year after diagnosis, whilst for disseminated histiocytic sarcoma, survival may be only 60 -100 days.

Mammary tumours: Canine mammary carcinoma has an uneven geographic distribution in the western world that may relate to practice with regard to neutering (spaying) bitches. Older data suggest that the lifetime risk of malignant mammary tumours increases rapidly with number of oestrus cycles over the lifetime of the dog: an early estimate was that in bitches spayed prior to their first oestrous cycles the risk was 0.05%. In those undergoing one oestrus cycle it was 8%, and in unspayed two year old dogs (undergoing two to three oestrus cycles), 26% (Schneider *et al*., 1969). Recently the idea that spaying has a direct effect on tumour incidence has been questioned on the grounds that the fairly small amount of published evidence on the topic was collected using methods now considered inadequate. Nevertheless it remains true that mammary tumours are more common in countries that do not spay their dogs, or do so late, than in those where spaying of non-breeding dogs occurs early. Like human breast cancer the canine disease occurs in different locations in the mammary gland and different tumours have different histological appearances and levels of malignancy, so that only about 30% of excised tumours are malignant (Misdorp, 2002). It is therefore unlikely that mammary tumours have either a single common genetic origin or a common pathogenesis history. However, breed predispositions, as well as susceptible lines within breeds, have been noted as in Table 1. In particular Spaniel breeds and Dachshunds have been suggested to be at higher risk.

Recently a large study that looked at potential predisposing genes for mammary carcinoma in the English Springer Spaniel in Sweden showed that there was an association with the tumour of germ line SNP variants around both *BRCA1* and *BRCA2*. Risk genotypes at each locus carrying a relative risk of about four (Rivera *et al*., 2009). In the same group of dogs, a protective *MHC* Class II haplotype has been identified in the at risk population, suggesting a role for the adaptive immune system in surveillance for this tumour (Rivera, 2010).

Anal Sac Gland Carcinoma (ASGC): Anal Sac Gland Carcinomas are adenocarcinomas arising from the apocrine secretory epithelium of the anal sac. They may occur in any breed, but are a significant problem in Cocker Spaniels where they are about seven times more common than in the

whole population, to a lesser extent in other spaniel types (English Springer and Cavalier King Charles) and in some other breeds (Goldschmidt and Shofer, 2002, Polton *et al*., 2006). The tumours occur in older animals, with typical onset at 8 to 12 years of age. If diagnosed early they are easy to treat surgically by removal of the tumour and local lymph nodes, with slight or negligible welfare consequences. On the other hand after metastatic spread to distant sites these tumours behave as aggressive cancers and are very difficult to treat.

Melanoma: Melanoma is a tumour in which there is uncontrolled proliferation of melanocytes. These cells produce either eumelanin (black or dark brown) or pheomelanin (yellow/red) pigments. In early development they migrate from the neural crest, and take on important roles in the sensory organs (especially eyes and ears), as well as in pigmentation of skin and hair. Melanomas are important tumours of the gums, skin, nail beds, eye and adnexa. At most of these locations melanomas are typically highly aggressive and metastatic, although some skin melanomas may be less aggressive. Unlike melanoma skin cancer in people, which occurs after UVB damage of lightly pigmented skin, most canine melanomas occur spontaneously in darkly pigmented areas where melanocytes are very abundant. Melanomas are associated with particular breeds, as listed in Table 2, but these are often associations with black coat colour, so that for example at least half of all digital melanomas occur in black coat colour dogs (Henry *et al*., 2005). Patterned breeds do not suffer melanoma at white skin locations (or in blue irises or other poorly pigmented or non-pigmented tissues) as melanocytes here are sparse or absent, but albino animals, or those with colour dilution mutations, can sometimes suffer unpigmented (amelanotic) melanomas, as non-melanin producing melanocytes may be present.

Haemangiosarcoma: Hemangiosarcomas are tumours of the vascular endothelium, where neoplastic growth forms tumours intimately associated with the blood vessels and containing lacunae of blood and are a common form of cancer. Visceral tumours are often located in the spleen or the right atrium of the heart, although other sites are not uncommon. Hemangiosarcomas in the skin are also common. Post mortem surveys suggest that up to two per cent of all elderly dogs may have preclinical splenic hemangiosarcoma at the time of death, and haemangioasarcomas account for 10-20% of all spleen problems seen in practice (Spangler and Cuthbertson, 1992). German Shepherd Dogs and, in the United States, Golden Retrievers show predisposition to visceral forms of the tumour, whilst skin forms are associated with dogs with light coloured short hair, such as Greyhounds, Whippets, Italian Greyhounds and Weimaraners.

Although haemangiosarcomas are tumours of later life, they are extremely dangerous tumours. They show widespread metastasis through their intimacy with blood vessels; they are associated with crises in which blood coagulation at remote sites occurs as a result of the tumour, and paradoxically, because of excessive consumption of platelets and clotting factors, tumour rupture results in internal breeding which is often fatal.

Mast cell tumours: Mast cells are cells that have a role in surveillance and defence of tissues against pathogens. When mature (in the tissues) they are distinguished by the presence of large basophilic granules rich in histamine, proteases, inflammatory cytokines and heparin, which are released on activation of the cell by IgE binding or in tissue damage. Tumours of mast cells (mastocytomas) are very common in dogs, represent up to 20% of all tumours in the skin (O'Keefe, 1990). They are also sometimes found at extracutaneous sites, including the conjunctiva, salivary gland, nasopharynx, oral cavity, gastrointestinal tract, and urethra. In the UK, breeds such as Boxers, Bulldogs, and Labrador and Golden Retrievers show high rates of these tumours.

In most dogs tumours are solitary but in 5–25% of cases they are multiple. Disseminated, multiple tumours almost always occur only as a sequel to an undifferentiated primary cutaneous mast cell tumour. These disseminated tumours are said to be more common in Pugs, and are very difficult to deal with therapeutically. The risks associated with the tumour arise not only from systemic spread but also from the activation and degranulation of mast cells that occurs in up to 50% of all mast cell tumours (O'Keefe, 1990). This can lead to ulceration and bleeding around the tumour site (or bleeding on surgical excision), or to gastrointestinal ulceration and (unusually) to anaphylactic shock.

Lymphoma: Lymphomas, or lymphosarcomas, are cancers that arise from lymphocytes, account for one quarter to one fifth of canine malignant tumours, and they occur in many breeds. There are a variety of types, with the most basic division being between B-cell and T-cell tumours. The tumours may be found as solid tumours in lymph nodes or bone marrow (lymphosarcoma) or as cancer cell populations in the blood (leukaemia). Boxers, Golden Retrievers, Mastiffs, Siberian Husky and Shih Tzu show a predisposition to T-cell lymphoma (Lurie *et al*., 2004), whilst Basset Hounds, Cocker Spaniels, German Shepherd Dogs and Rottweilers show relative predisposition to B-cell lymphoma (Modiano *et al*., 2005a), suggesting that there is an inherited component to the tumour subtype.

Genetics of Cancer

In most cases in dogs, it has not yet been possible to determine the actual genes involved, but from what has already been discovered and by analogy with cancer in humans, mutations in three different types of pathway may be involved.

- The first type of pathway is one that causes a cell to divide to form two daughter cells. The capacity to do so is very important in normal life. If the skin, or lining of the gastrointestinal tract, was not renewed, or if red blood cell production was not initiated after trauma, or particular lymphocytes (immune cells) were not produced in response to a new virus challenge; life span would be brief. These proliferation pathways are often controlled by genes that are found mutated into permanently active or stable forms in cancers. Such genes are called oncogenes. The majority of mast cell tumours in dogs contain mutations in an oncogene called *CKIT*, although it is not known if the same gene can give inherited predisposition to this tumour.
- Another set of pathways swings into action when a cell has proliferated enough and it is time to stop, or even for previously growing cells to *'commit suicide'*. For instance, if an invading virus has been eliminated (see previous paragraph), production of the particular lymphocyte that attacks it needs to be stopped so as to make room for the response to the next virus, that is, for the next type of lymphocyte to undergo activation. In fact there are many cycles in the body in which cell death is important to keep the whole organism healthy and functioning. This process is controlled by pathways that include another set of genes that can be mutated in cancer: appropriately known as tumour suppressor genes. If these genes do not work, then cells fail to stop multiplying - another path to cancer. A familiar example of mutations in this type of gene is seen in human breast and ovarian cancer, where some families have greatly increased risk of these cancers, associated with inherited mutations in either of two tumour suppressor genes known as *BRCA1* and *BRCA2* (for breast cancer one and two). In dogs, variants of these two genes have also been associated with mammary cancer in English Springer Spaniels.
- Finally, it is known that one important function of the immune system is to recognise and prevent growth of some types of tumour. For example, immunodeficient humans (such as those with HIV) have high rates of specific types of lymphoma and of a virus associated tumour called Kaposi's sarcoma. A small number of human tumours are associated with particular normal variants in a feature of the immune system called the Major Histocompatability Complex (or MHC). Similarly, anal sac carcinomas in Cocker Spaniels are associated with particular MHC variants. A common variant predisposes, whilst another protects against this tumour.

RECOMMENDATIONS

In terms of what should be done next it is clear that cancers are a very difficult area to tackle and progress has been slow even in human medicine. Even cancer predispositions will be difficult to breed away from, in that most cancers are diseases of later life and breeding will usually have taken place before cancer manifests itself. However, cancer predispositions allow the potential to use genetic mapping to disclose the genes involved. The formation of tumours usually involves many genetic changes in the tumour cells, but predispositions are likely to be less genetically complex, involving one or a few genes. If these can be discovered, then one could test for them and breed away from them. In addition, for some cancers in non-essential organs such as the anal sac, DNA testing suggesting that a dog is predisposed to a tumour could be used to advise prophylactic surgery, removing the susceptible organ. It should be remembered though, that cancer predisposing mutations are unlikely to be fully penetrative; only a proportion of animals with the mutation will actually suffer cancer. Hence prophylactic

treatment will expose animals to risk and morbidity associated with surgery and only a proportion of these would actually have suffered from the cancer that the surgery prevents.

In the long term, the other way forward will be through research into rational forms of novel therapy. An example is the use of imanitib mesylate (Gleevec) and other tyrosine kinase inhibitors in treating mast cell tumours, melanomas and some lymphomas. Further research of tumour biology in dogs may uncover other targets for which inhibitors can be rationally designed.

Table 1

The cancers reported as in excess in particular breeds

Those with very large excess are in bold type

Breed/type	**Tumour types seen in excess**
Airedale Terrier	nasal carcinoma trichoepithelioma pancreatic islet cell tumour pheochromocytoma (adrenal chromaffin cells) plasmacytoma (cutaneous)
Alaskan Malamute	anal sac adenocarcinoma thyroid
American Pit Bull Terrier	histiocytoma (cutaneous, benign)
American Cocker Spaniel	See cocker spaniel (American cocker)
Basset Hound	nasal carcinoma squamous cell carcinoma (skin) trichoepithelioma
Beagle	mammary carcinoma, urinary bladder (transitional cell carcinoma) thyroid
Bernese Mountain Dog	**histiocytic sarcoma**
Bichon Frise	basal cell tumors
Borzoi	**osteosarcoma**
Boston terrier	brain tumors (glioma)

	histiocytoma (cutaneous, benign) mast cell tumors
Boxer	thyroid **brain tumors (gliomas/glioblastomas, astrocytoma)** hyperadrenocorticism histiocytoma (cutaneous, benign) lymphoma/leukemias mast cell tumors
Brittany Spaniel	perianal (hepatoid) gland tumors
Bulldog	brain tumors (glioblastoma) histiocytoma (cutaneous, benign) lymphoma/leukemias mast cell tumors
Bullmastiff	trichoepithelioma **osteosarcoma** lymphoma/leukemias
Bull Terrier	histiocytoma (cutaneous, benign)
Chow Chow	**gastric carcinoma**
Cockapoo	basal cell tumors
Cocker Spaniel (American Cocker)	ceruminous gland carcinoma (ear wax gland) perianal (hepatoid) gland tumors basal cell tumors histiocytoma (cutaneous, benign) lymphoma/leukemias
Cocker spaniel (English cocker)	mammary carcinoma, **anal sac adenocarcinoma** perianal (hepatoid) gland tumors histiocytoma (cutaneous, benign) melanoma (oral) plasmacytoma (cutaneous)

Collie breeds	nasal carcinoma
Dachshund breeds	mammary carcinoma, anal sac adenocarcinoma squamous cell carcinoma (nail bed) hyperadrenocorticism
Dalmatian	histiocytoma (cutaneous, benign)
Dobermann	histiocytoma (cutaneous, benign) osteosarcoma
English Mastiff	osteosarcoma
English Setter	trichoepithelioma lymphoma/leukemias
English Springer Spaniel	mammary carcinoma anal sac adenocarcinoma basal cell tumors trichoepithelioma histiocytoma (cutaneous, benign)
Flat-coated Retriever	histiocytoma (cutaneous, benign) **histiocytic sarcoma**
Fox Terrier (Wire Haired)	urinary bladder (transitional cell carcinoma) Pheochromocytoma (adrenal chromaffin cells)
German Shepherd Dog	ceruminous gland carcinoma (ear wax gland), mammary carcinoma renal (cystadenocarcinoma) (Germany, Scandinavia, USA only, single gene, DNA test) intracutaneous cornifying epethilioma pancreatic islet cell tumour **haemangiosarcoma**
German Short Haired Pointer	mammary carcinoma, nasal carcinoma

Golden Retriever	trichoepithelioma thyroid histiocytic sarcoma haemangiosarcoma (in USA especially) melanoma (oral, eye)
Gordon Setter	squamous cell carcinoma (nail bed)
Great Dane	**osteosarcoma**
Great Pyrenees	osteosarcoma
Greyhound	osteosarcoma
Hungarian Vizsla	perianal (hepatoid) gland tumors
Irish Setter	trichoepithelioma pancreatic islet cell tumour lymphoma/leukemias
Irish Wolfhound	**osteosarcoma**
Parson Jack Russell Terrier	histiocytoma (cutaneous, benign)
Keeshond	squamous cell carcinoma (skin)
Kerry Blue Terrier	basal cell tumors squamous cell carcinoma (nail bed)
Labrador Retriever	squamous cell carcinoma (oral & sub-ungual (nail bed)) histiocytoma (cutaneous, benign) **mast cell tumors**
Lhasa Apso	intracutaneous cornifying epethilioma perianal (hepatoid) gland tumors
Newfoundland	osteosarcoma
Norwegian Elkhound	intracutaneous cornifying epethilioma
Pekingese	perianal (hepatoid) gland tumors
Poodle (Miniature and Toy)	basal cell tumors hyperadrenocorticism melanoma (oral)
Poodle (Standard)	squamous cell carcinoma(oral)

	intracutaneous cornifying epethilioma squamous cell carcinoma (skin) squamous cell carcinoma (nail bed) trichoepithelioma pancreatic islet cell tumour hyperadrenocorticism plasmacytoma (cutaneous)
Pug	brain tumors histiocytoma (cutaneous, benign) mast cell tumors
Rottweiler	squamous cell carcinoma (nail bed) histiocytoma (cutaneous, benign) histiocytic sarcoma melanoma (sub-ungual)
Saint Bernard	osteosarcoma
Samoyed	oral (squamous cell carcinoma) perianal (hepatoid) gland tumors
Schnauzer (Giant)	squamous cell carcinoma (claw bed) **melanoma** (claw bed)
Schnauzer (Miniature)	trichoepithelioma histiocytoma (cutaneous, benign)
Schnauzer (Standard)	squamous cell carcinoma (nail bed)
Scottish Terrier	nasal carcinoma urinary bladder (transitional cell carcinoma) assoc. with herbicide use in USA squamous cell carcinoma (nail bed) histiocytoma (cutaneous, benign) **melanoma** (nail bed) plasmacytoma (cutaneous)
Shar-Pei	histiocytoma (cutaneous, benign)
Shetland Sheepdog	nasal carcinoma,

	urinary bladder (transitional cell carcinoma) basal cell tumors
Shih-Tzu	perianal (hepatoid) gland tumors
Siberian Husky	basal cell tumors perianal (hepatoid) gland tumors thyroid
Terveuren (Belgian Sheepdog)	gastric carcinoma
Weimaraner	mast cell tumors
West Highland White Terrier	urinary bladder (transitional cell carcinoma) assoc. with herbicide use in USA basal cell tumors histiocytoma (cutaneous, benign)
Yorkshire Terrier	intracutaneous cornifying epethilioma

AUTOIMMUNE DISEASES

Professor Michael Day

INTRODUCTION AND OVERVIEW

The immune system of the body is made up of a complex network of cells and molecules that is essential for defence against a wide range of infectious diseases. In certain individual people and animals the immune system inappropriately turns its attention to one or more normal body tissues. An immunological attack against an individual's own body tissue (self tissue) is known as an autoimmune response and may give rise to an autoimmune disease. Autoimmune diseases have a complex basis with multiple background factors contributing to their onset. The strongest predisposing factor is genetic background (the diseases occur in particular human races and are often inherited through multiple generations of families), but other contributing factors include lifestyle, gender and exposure to triggering infectious agents. Immunologically, the basis of autoimmune reactions is the failure of a particular type of immune cell (the natural T regulatory cell) to properly control other immune cells (effector T and B lymphocytes) that are responsible for causing the tissue damage.

Autoimmune diseases are of great importance in human medicine; there are over 100 recognized autoimmune conditions that are estimated to affect 10% of the adult population. The diseases affect a wide spectrum of body tissues and are often broadly divided into musculoskeletal, neurological, endocrine, dermatological, haematological and gastrointestinal disorders. Some patients develop multisystemic autoimmune diseases that target multiple body tissues. The costs associated with the management of human autoimmune diseases are significant. In 2010-11 the costs of direct patient care related to type I diabetes mellitus (the autoimmune form of diabetes) in the UK were £1 billion with indirect costs of £0.9 billion. By 2035-36, these costs are estimated to increase to £1.8 billion and £2.4 billion, respectively. The

top 10 drugs comprising the NHS spend in 2011 were biological products used to treat autoimmune diseases; the top two being arthritis drugs on which £214 million was spent.

Dogs appear to develop spontaneously the same spectrum of autoimmune diseases that occur in people. These diseases have been the subject of much research attention since the pioneering studies of Lewis and Schwartz in the 1960s on canine systemic lupus erythematosus. It is clear that the canine diseases are excellent models of the equivalent human conditions and share the same predisposing factors, immunological abnormalities, clinical appearance and response to medical therapy. The similarity between canine and human autoimmune disease means that investigation of the canine disorders may contribute to understanding of the diseases in man and provides an excellent example of the '*One Health'* approach to medical research.

Since the publication of the canine genome in 2005, the greatest advances have been made in understanding the genetic basis of canine autoimmune diseases. Early studies (from the 1970s onwards) focussed on determining whether inheritance of autoimmune disease (in people and in dogs) was linked to a cluster of 'immune response' genes known as the 'major histocompatibility complex' (MHC). The canine MHC is also known as the dog leucocyte antigen (DLA) system. More recent technology allows scanning of the entire genome (as opposed to a single gene cluster) to search for genes that may contribute to autoimmunity. Such 'genome-wide association studies' (GWAS) are now unravelling the genetic basis of canine autoimmunity.

It is clear that autoimmune diseases of a wide range of different types occur with frequency in particular breeds of dog and may also run through multigenerational pedigrees. There is no simple mode of inheritance as these are complex polygenic disorders. Occasional studies (going back to the work of Lewis and Schwartz) have shown that deliberate breeding can generate colonies of affected dogs that are invaluable for progress in research, but also provide some insight into the complexities and potential complications of close breeding.

HYPOTHYROIDISM

Hypothyroidism (also known as 'lymphocytic thyroiditis' or in man 'Hashimoto's thyroiditis') is one of the better documented canine autoimmune diseases and is described in brief detail here as it exemplifies many of the features found in autoimmune disease. Progressive destruction of the thyroid glands leads to complex metabolic disease affecting a number of body systems. The clinical presentation includes lethargy, heat seeking, obesity, skin alterations, neuromuscular weakness, ocular lipid deposition and reproductive failure. The disease may be managed by supplementation of the thyroid hormone (thyroxine; T4) in the form of levothyroxine.

The autoimmune nature of hypothyroidism is confirmed by the demonstration of serum autoantibodies specific for the precursor molecule of thyroid hormones (thyroglobulin) and, less commonly, the enzyme thyroid peroxidase and the circulating forms of thyroid hormone (triiodothyronine [T3] and T4). Additionally, affected dogs have clear evidence of infiltration of the thyroid tissue by lymphocytes and plasma cells (lymphocytic thyroiditis). Many of the infiltrating lymphocytes are cytotoxic cells that are responsible for destruction of the thyroid follicular epithelium. Equivalent disease occurs in humans and arises spontaneously in some inbred strains of laboratory rodents. Lymphocytic thyroiditis is one of the few autoimmune diseases that have been induced experimentally in dogs by injection of the dominant autoantigen (thyroglobulin).

Measurement of thyroglobulin autoantibody, thyroid stimulating hormone (TSH) and thyroid hormones is used to stage canine hypothyroidism clinically and may also be used to screen dogs of susceptible breeds for preclinical disease. The disease progresses through the stages of (1) subclinical lymphocytic thyroiditis, (2) subclinical hypothyroidism, (3) antibody-positive overt hypothyroidism, and (4) end stage lymphocytic thyroiditis.

As for many other canine autoimmune diseases, there is evidence for a genetic predisposition to hypothyroidism. Over 30 years ago the disease was reported in colonies of Beagles bred for experimental purposes and a kennel of Great Danes was reported in which autoantibody and clinical disease ran through several generations. There are suggested predispositions in a wide range of breeds including the Dobermann, Poodle, Irish Setter, Miniature Schnauzer, Boxer, Golden Retriever, Dachshund, Shetland Sheepdog, Pomeranian, Cocker Spaniel, Basenji, Borzoi, English Pointer, English Setter, Skye Terrier, German Wirehaired Pointer, Old English Sheepdog, Maltese, Kuvaz, Petit Basset Griffon Vendeen, Rhodesian Ridgeback and Airedale Terrier. More recent epidemiological studies have shown a predisposition in Giant Schnauzers and Hovawarts and, as for many other autoimmune diseases, an association with particular allelic forms of genes of the major histocompatibility complex was documented for the Giant Schnauzer. MHC gene associations have also been shown in affected Dobermanns and Golden Retrievers. Another study has investigated autoimmunity in Italian Greyhounds, which may develop a range of autoimmune disorders including hypothyroidism. Genetic associations (by genomic screening) were also shown to underlie this predisposition, although the dogs chosen for the genetic analysis presented with autoimmune conditions other than hypothyroidism.

SUMMARY

The major canine autoimmune diseases for which there is strong observational or genetic data showing a breed predisposition are summarised in Table 1. Some of these breed predispositions are global in their distribution (e.g. the predisposition of Cocker Spaniels for autoimmune haematological disease) and probably relate to the wide distribution of disease-associated genes as related breeding stock (selected perhaps on a phenotypic basis) or material for artificial insemination moved to different countries. Other predispositions are geographically localised (e.g. the predisposition of the Maltese to autoimmune haemolytic anaemia in Victoria, Australia) and may reflect regional inbreeding without regular importation of new blood lines.

It is difficult to estimate the prevalence and cost impact of canine autoimmune diseases. Some of the disorders are not infrequent (i.e. those affecting the blood, skin and joints), but others are relatively rare or restricted to less popular breeds. The diseases are often clinically severe and lead to the death of the animal, or at best require aggressive medical therapy with powerful immunomodulatory drugs that carry a range of side effects. Some dogs require lifelong ‘maintenance therapy’ with these drugs in order to keep the disease controlled. It is of great importance that we continue to investigate these disorders and their genetic basis. Such knowledge not only provides clues to the inheritance of human autoimmune diseases, but may also lead to the development of genetic screening tools that could identify at-risk animals and allow for controlled breeding programmes that might eliminate these devastating and often life-threatening diseases from a breed.

CONCLUSIONS

- Autoimmune diseases are of major clinical significance in human and canine medicine.
- Autoimmune diseases are complex disorders involving a failure of the immune system that has a genetic basis and is influenced by other predisposing factors.
- Canine autoimmune diseases are often breed-related and may be inherited.
- Genomic research is gradually identifying genes that are strongly associated with the development of breed-related autoimmune diseases.

RECOMMENDATIONS

- An individual dog of a predisposed breed that develops an autoimmune disease should ideally not be used for breeding.

- Autoimmune diseases may often not develop until after the age of breeding and so due consideration should be given to the future mating of animals from litters in which a parent has well-documented autoimmune disease.
- If breeders do decide to breed from close relatives of dogs that are affected with an autoimmune disease, careful research of potential mates and their genetic background should be undertaken in order to avoid the risk of increasing the frequency of disease in future generations.
- Breeders of dogs of predisposed breeds should strongly support research initiatives that aim to determine the prevalence of an autoimmune disease within a breed or to identify genetic associations with autoimmune diseases. The greatest advances in this area have come when breed groups have commissioned and funded research and have provided appropriate samples from affected and normal dogs.
- Where genetic tests become available that may predict susceptibility to autoimmune disease, breeders should be encouraged to use them. For example, a genetic test for Pug dog encephalitis is now available (http://www.vgl.ucdavis.edu/services/PDE.php).

Table 1

Some Breed-Associated Autoimmune Diseases in the Dog

Disease	Breed	Evidence base for genetic basis
Autoimmune haemolytic anaemia	Cocker Spaniel, English Springer Spaniel	Published clinical case series suggests breed susceptibility Pedigree analysis MHC gene association study
	Old English Sheepdog	Published clinical case series suggests breed susceptibility Pedigree analysis
Autoimmune thrombocytopenia	Cocker Spaniel	Published clinical case series suggests breed susceptibility
Hypoadrenocorticism (Addison's-like disease)	Nova Scotia Duck Tolling Retriever, Cocker Spaniel, Springer Spaniel, Labrador Retriever, West Highland White Terrier, Bearded Collie, Standard Poodle	Published clinical case series suggests breed susceptibility MHC gene association study
Hypothyroidism (Lymphocytic thyroiditis)	Great Dane Beagle Giant Schnauzer, Hovawart Giant Schnauzer, Dobermann,	Published familial group Disease documented in research colony Published epidemiological study and clinical case series suggests breed susceptibility MHC gene association study MHC gene association study

	Golden Retriever Many other breeds appear to be predisposed: Airedale Terrier, Basenji, Borzoi, Boxer, Cocker Spaniel, Dachshund, English Pointer, English Setter, German Shepherd Dog, German Wirehaired Pointer, Irish Setter, Italian Greyhound, Kuvasz, Maltese, Miniature Schnauzer, Old English Sheepdog, Petit Basset Griffon Vendeen, Pomeranian, Rhodesian Ridgeback, Rottweiler, Shetland Sheepdog, Skye Terrier, Standard Poodle	MHC gene association study
Type I diabetes mellitus	Cairn Terrier, Bichon Frise, Miniature Poodle, Miniature Schnauzer, Samoyed, Tibetan Terrier,	Published clinical case series suggests breed susceptibility
Polyendocrine syndrome	Italian Greyhound	Published clinical case series suggests breed susceptibility MHC gene association study
Multisystems autoimmunity (SLE overlap syndrome)	Nova Scotia Duck Tolling Retriever	Published clinical case series suggests breed susceptibility Genome wide association study
Systemic lupus erythematosus	German Shepherd Dog Cocker Spaniel	Research colony bred for disease MHC gene association study Spontaneous disease in breeding colony MHC gene association study
Uveodermatological syndrome (Vogt-	Japanese Akita	MHC gene association study (Japanese Akita)

Koyanagi-Harada-like syndrome)	Australian Setter, Chow Chow, Golden Retriever, Irish Setter, Old English Sheepdog, Samoyed, Siberian Husky, Shetland Sheepdog, St Bernard	Published clinical case series suggests breed susceptibility
Chronic superficial keratoconjunctivitis	German Shepherd Dog	Published clinical case series suggests breed susceptibility MHC gene association study
Nictitans plasmacytic conjunctivitis	German Shepherd Dog	Published clinical case series suggests breed susceptibility
Ligneous conjunctivitis	Dobermann	Published clinical case series suggests breed susceptibility
Keratoconjunctivitis sicca	English Bulldog, Lhasa Apso, Shih-Tzu, West Highland White Terrier	Published clinical case series suggests breed susceptibility
Chronic hepatitis	American Cocker Spaniel, Cairn Terrier, Dalmatian, Dobermann English Springer Spaniel, English Cocker Spaniel, Great Dane, Labrador Retriever, Samoyed	Published clinical case series suggests breed susceptibility MHC gene association study
Exocrine pancreatic insufficiency	German Shepherd Dog,	Published clinical case series suggests breed susceptibility
Necrotising meningoencephalitis	Maltese, Pug	Published clinical case series suggests breed susceptibility MHC gene association study
Necrotising leucoencephalitis	Chihuahua, Shih-Tzu, Yorkshire Terrier	Published clinical case series suggests breed susceptibility
Greyhound meningoencephalitis	Greyhound	Published clinical case series suggests breed susceptibility Genome wide association study

Polyarthritis/ meningitis syndrome	Bernese Mountain Dog, Boxer, German Shorthaired Pointer, Japanese Akita, Newfoundland, Weimaraner	Published clinical case series suggests breed susceptibility
Polyarthritis of Japanese Akitas	Japanese Akita	Published clinical case series suggests breed susceptibility
Familial renal amyloidosis of Chinese Shar Peis	Shar Pei	Published clinical case series suggests breed susceptibility Genome wide association study
Extraocular myositis	Golden Retriever	Published clinical case series suggests breed susceptibility
Polymyositis	Boxer, Hungarian Vizsla, Newfoundland	Published clinical case series suggests breed susceptibility
Myasthenia gravis	Chihuahua, German Shorthaired Pointer, Hungarian Vizsla, Japanese Akita, Scottish Terrier, Newfoundland	Published clinical case series suggests breed susceptibility Pedigree analysis (Newfoundland)
Pemphigus foliaceus	Bearded Collie, Chow Chow, Dobermann, Japanese Akita, Newfoundland, Shetland Sheepdog	Published clinical case series suggests breed susceptibility
Nasal planum cutaneous lupus erythematosus	Collie, German Shepherd Dog, Shetland Sheepdog	Published clinical case series suggests breed susceptibility
Vesicular cutaneous lupus erythematosus	Collie Shetland Sheepdog	Published clinical case series suggests breed susceptibility
Exfoliative cutaneous lupus erythematosus of German Shorthaired Pointers	German Shorthaired Pointer	Published clinical case series suggests breed susceptibility Research colony bred for disease
Dermatomyositis	Collie, Shetland Sheepdog	Published clinical case series suggests breed susceptibility Research colony bred for disease MHC gene association study

Sebaceous adenitis	Dachshund, Hungarian Vizsla, Japanese Akita, Samoyed Standard Poodle	Published clinical case series suggests breed susceptibility Pedigree analysis MHC gene association study (Standard Poodle)
Alopecia areata	Dachshund, German Shepherd Dog	Published clinical case series suggests breed susceptibility

Appendix 3

ADVISORY COUNCIL STANDARD FOR BREEDING DOGS

(Reflecting joint working party discussion on 12.08.14 and as agreed by the Advisory Council on 30/9/14)

Standard	***Guidance***
1. The breeder must comply with all legislation relevant to their breeding establishment. Welfare legislation requires dogs' needs to be provided and they are expressed thus: "an animal's needs shall be taken to include (a) its need for a suitable environment, (b) its need for a suitable diet, (c) its need to be able to exhibit normal behaviour patterns, (d) any need it has to be housed with, or apart from, other animals, and (e) its need to be protected from pain, suffering, injury and disease."	*All dogs in England and Wales are subject to the Animal Welfare Act 2006, in Scotland to the Animal Health and Welfare (Scotland) Act 2006, and in Northern Ireland to the Welfare of Animals Act (Northern Ireland) 2011. In addition some breeders may be subject to additional legislation. A list and summary of their provisions is given at Annex A.* *While this standard is not constructed strictly in the same order as the legislation, the Advisory Council considers that complying with these standards is likely to fulfil the requirements of the welfare legislation.*
2. Records must be kept for all activity relating to the dogs and kept for 10 years. Records must include: a. Name, date of birth and permanent identification number; b. Breed where appropriate; c. Colour and other distinguishing marks; d. Registration number where appropriate; e. Date of acquisition; f. All veterinary treatment; g. Dates of mating; h. For bitches, date of whelping and number of puppies; i. For dogs, dates of matings and number of puppies; j. Results of all tests for inherited defects and the date of the tests; k. Date of leaving the breeder, and contact details for destination.	*Records may be kept manually or on computer. When kept on computer some means of printing records for an inspector should be available.*

3. When euthanasia is required at any age it must be carried out by a veterinary surgeon and recorded to include the reason for euthanasia and the name of the veterinary surgeon who performed it. Breeding stock must not be routinely euthanased when no longer required for breeding and measures must be demonstrated to ensure breeding stock can be successfully re-homed.	*This applies equally to terminally ill breeding stock as well as to puppies. Puppies should not be euthanased simply because they have a colour or conformation defect that will not affect welfare or can be corrected without compromising welfare. Affected dogs should be neutered. Ex breeding stock should only be euthanased where they are incapable of being re-homed, as certified by either a veterinary surgeon, or a behaviourist working at the level of Applied Animal Behaviourist, Clinical Animal Behaviourist or Veterinary Behaviourist, as defined by the Animal Behaviour and Training Council (www.abtcouncil.org.uk).*
BREEDING ANIMALS[1]	
4. All dogs must be kept in an environment which enables them to display normal behavioural characteristics. There must be social contact with other dogs and humans. All dogs used for breeding must be selected for temperament characteristics suitable for their intended purpose.	*Fulfilment of social needs may be provided by mixing compatible dogs and by contact with humans. When the social interaction is provided solely by humans, there should be contact at regular intervals during the day. When dogs are kept in a kennel environment this should be the working day and in a domestic environment the normal waking hours of the household. Care should be taken when mixing dogs, especially when close to whelping or when lactating, and they should be maintained in groups compatible in terms of temperament, size, and number. When dogs are mixed, the compatibility of the dogs may vary depending on the stage of the breeding cycle and their age and this should be borne in mind.* *In this context the purposes for which dogs are bred must be humane.*
5. Dogs must have access to clean drinking water.	*Unless automatic drinkers are provided, drinking water must be checked at least twice daily. Where dogs are mixed it is advisable to provide a number of drinking bowls. How often bowls are re-filled will depend on circumstances*

[1] A breeding dog is defined as one greater than one year old kept by a breeder for breeding

	and the potential for contamination. When dogs are transported they should be offered water.
6. Dogs must be fed a diet appropriate to their age, breed, activity level and stage of the breeding cycle. Adult dogs must be fed individually with separate bowls. Food must be stored in vermin-proof containers and fresh food must be refrigerated	*For most dogs in breeding establishments two meals should be provided daily. Pregnant bitches will require increasingly frequent meals of high quality food as their pregnancy progresses. Lactating bitches also need frequent high quality food to prevent excessive weight loss. Ad lib feeding may be appropriate. Activity feeders will enhance dogs' mental stimulation.* *Dogs should be weighed regularly and their body condition observed.*
7. There must be an area for food preparation. Hot and cold running water must be provided.	*To ensure proper hygiene the kitchen should be kept clean and dry. A cleaning and feeding Standard Operating Procedure (SOP)[2] should be provided.*
8. Dogs kept in domestic premises must have a specific bed or indoor kennel. The bed must have clean bedding. The bed and any indoor kennel provided must be large enough for each dog to lay flat on its side and stand in a natural standing position.	*Keeping dogs in domestic premises occupied by people provides a good social environment that has adequate temperature control and ventilation. However more care may be required to ensure adequate hygiene when floors are covered with permeable covering such as carpet. Where indoor kennels are used, dogs should not be confined in them for more than eight hours a day without being let out during this period for exercise and socialization with both humans and other animals. Dogs sharing an indoor kennel should always be compatible in both temperament and stage of breeding cycle.*
9. Dogs kept in kennel accommodation must be provided with a clean and durable environment. a. Kennels must be constructed of impermeable material that can be cleaned and disinfected. b. Kennels must be divided into sleeping and activity areas. No floor	*The use of wood for kennel surfaces is undesirable. Where it is used it should be painted or lined with waterproof material so that it is impermeable and should be kept in good, splinter-free condition. Wood should not be used in new builds. The floor must be smooth concrete or tiles or a similar*

[2] Sample SOPs are available on the Advisory Council website www.dogadvisorycouncil.org.uk

area dimension may be less than 1.5m. Dogs must be able to lie flat on their sides outside their bed in the sleeping area. The activity area must be a minimum of $4m^2$ for a single dog and a minimum $1m^2$ for each additional dog. Dogs must be able to walk, turn around easily, wag their tails without touching the kennel sides, and lie down without touching another dog. c. The sleeping area must contain a bed with clean bedding large enough for the dog to lie flat on its side. d. The kennel must have sufficient lighting to enable dogs to be examined and the kennel to be cleaned. e. There must be sufficient ventilation to prevent excessive odours or contamination without causing draughts. f. The kennel must be constructed to minimise noise levels.	*impermeable and cleanable surface.* *Kennels should be of a sufficient height to allow dogs to move freely and to allow efficient cleaning.* *Heating should be provided to ensure the temperature does not fall below the minimum. This may be by 'spot' heaters. It is recognised that high external ambient temperature may make it difficult to achieve the maximum at all times. High temperatures should be alleviated by providing additional air movement. There should be some part of the sleeping area where the dog is able to enjoy a temperature of between 10 ^oC and 26 ^oC. Temperature should be relevant to the breed/type of dog.* *Kennels should have natural daylight.* *Noise can be reduced by the use of noise absorbent materials such as ceiling tiles in the construction of the kennel. External sources of noise should also be minimised.*
10. There must be a written routine cleaning regime. This must include the removal of faeces at least twice daily and routine disinfection. Floors must be dried after cleaning. Adequate routine cleaning procedures must be in place to ensure that the environment remains clean and free from infectious organisms.	*A cleaning SOP should be provided. Kennels and outside exercise areas should be cleaned and disinfected between occupants.*
11. Dogs must be provided with environmental enrichment and the ability to have some control over their environment.	*Toys and activity feeders that are changed regularly are ideal enrichment and more active breeds should have more exercise. There should be more toys or feeders than there are dogs in the kennel. The use of raised beds and the ability to move out of other dogs' sight should be provided.*
12. All dogs must have access to an exercise area and must be allowed a	*Exercise may be provided by walking individual or small groups of dogs or by access to an exercise run appropriate to the size and breed of dog. The use of*

minimum of two periods daily of at least 30 minutes to exercise freely.	*further enrichment such as swimming or fetching a ball should be encouraged. Breed specific behavioural characteristics should be taken into account when providing environmental enrichment.*
13. Separate bitches in season securely from entire males.	
14. In addition to the habituation set out in paragraph 38, breeding dogs must be trained to fulfil basic requirements. They must be capable of being physically examined and treated under normal conditions. They must not cause unreasonable nuisance to neighbours or to visitors to the property.	*Basic training should be given to all dogs so that they can be handled easily and safely and can be re-homed at the end of their breeding career. Reward based training should be used. Basic requirements include walking on a lead and coming when called.*
15. All breeding stock must be permanently identified and registered on a recognised database.	*Microchip is the preferred method of identification, implanted by a trained operator. Other validated means of identification may be acceptable.*
16. Breeding stock must be selected on their temperament and their physical and genetic health. Breeders must take all reasonable steps to ensure that breeding stock is of good physical and genetic health, and acceptable temperament and fit for function. Fit for function means being able to see, breathe normally and be physically fit and able to run freely. Breeders must make use of scientifically validated health screening schemes relevant to the breed or cross breed.	*The great majority of dogs live as pets in a domestic environment. Their health and behaviour are therefore far more important than their appearance. It is accepted that a physical examination by a veterinary surgeon may be useful.* *Dogs that display adverse temperament traits, such as withdrawal from or aggression towards handlers or other dogs, should not be bred from.* *The intention of testing for inherited disease is to improve genetic health and that can only be achieved by selecting the best breeding stock. Where tests are based on DNA, affected dogs should not normally be used for breeding and carrier dogs should normally only be mated to clear dogs. It is recognised, however, that the careful breeding of affected animals to clear animals may be acceptable in certain breeds, depending on the severity of the condition and the individual breed's genetic picture. Where such tests*

	provide a score, no dog should be used for breeding if their score is worse than the average published for the breed. Longevity of relatives, particularly in short-lived breeds, should also be considered. *Genetic advice should be provided in writing for both the breeder and provided to the purchaser of any puppy.* [3]
17. All dogs must be examined daily and any signs of disease or injury acted upon.	*The examination does not need to be extensive and should include the dog's behaviour. Treatment does not necessarily imply veterinary intervention as some disease, e.g. mild diarrhoea, may only require self-directed management.*
18. Breeders must take reasonable precautions to prevent the spread of infectious disease and make available facilities for the treatment of dogs in an emergency. The breeder must have a veterinary health plan for their dogs as agreed with their veterinary surgeon. All veterinary treatment must be recorded.	*The health plan may be a very simple document detailing routine treatments required, disease prevention procedures, and procedures related to breeding. These should include measures to prevent the transmission of roundworm larvae from bitch to puppies. As a minimum this should include an annual examination by a veterinary surgeon, vaccination, and regular treatment for external and internal parasites. A draft plan is at Annex A.* *Adequate arrangements or plans should be available for the isolation of sick or injured dogs and their transport when necessary to and from the establishment for veterinary treatment.* *All medications should be used in accordance with the manufacturers' instructions unless otherwise advised by a veterinary surgeon. They should be stored safely and securely, and only used within their expiry date.*

[3] Useful advice is available on the Advisory Council website www.dogadvisorycouncil.org.uk The Kennel Club 'mate select' also provides advice.

19. There must be procedures for monitoring the health status of new dogs introduced to the breeding establishment.	*A veterinary health record detailing identification and preventive treatments should be provided by the vendor. In breeding establishments where dogs are accommodated in kennels a quarantine area should be provided in which all new dogs are kept for 14 days to prevent any possible transmission of disease or infection to resident dogs. Extra human contact during this period is advisable. At the end of the quarantine period, introduction to the resident dogs should be controlled. Care should be taken in introducing dogs to existing groups of dogs in a domestic environment, to avoid stress to either new or resident animals. Where new dogs are introduced to groups in either domestic or kennel environments, behaviour should be observed for signs of aggression or fear.*
20. Dogs whose breeding career has ended must either be retained for the rest of their natural life, be responsibly re-homed or, as a last resort, euthanased by a veterinary surgeon. Dogs must be neutered prior to re-homing.	*Responsible re-homing should include an assessment of the adopter to ensure that they can provide a suitable home environment, and a requirement to return the dog if the adopter is unable to continue to care for it.*
BREEDING AND REARING	
21. All dogs and bitches must be at least one year old before they are mated.	*It is as important for male dogs as it is for bitches that they are physically and mentally mature before they are allowed to breed. Some breeds mature later and may need to be older and some inherited diseases are late onset. Consequently the decision about when to breed should be related to these factors. Some breed clubs may provide specific guidance.*
22. Bitches must not have litters too close together and must not have more than four litters in their lifetime.	*Bitches should not have litters less than 12 months apart. Pregnancy and lactation are a significant drain on metabolic resources and sufficient interval must be left to allow for full recovery after a litter.*
23. Bitches that have had two caesarean sections must not be bred from	*It is very likely that a bitch that has required a caesarean section will require*

again.	*surgery at a subsequent whelping. It is not in the welfare interests of the bitch to be bred from again.*
24. Breeders must take all reasonable steps to ensure that proposed parents are not closely related and breeders must never mate a sire with his daughter, a dam with her son or full siblings with each other.	*Inbreeding is likely to increase the risk of producing puppies that are affected with inherited disorders. Breeders should not mate a grandparent to a grandchild.* *COI is one measure of the degree to which any given dog is already inbred For dogs registered with the Kennel Club COI's are available at MateSelect.* *www.the-kennel-club.org.uk/services/public/mateselect/Default.aspx* *Useful information is available on the Advisory Council website at www.dogadvisorycouncil.org.uk*
25. Individual dogs with health issues caused by over exaggeration of physical features must not be used in a breeding programme.	*Dogs with the most exaggerated conformations that are associated with adverse welfare should not be bred from. This includes dogs that have required surgery to rectify an exaggerated conformation that has caused adverse welfare.*
26. Bitches must not be transported later than 49 days after mating and for 48 hours after whelping unless to a veterinary surgeon for treatment.	*The stress of transport is more likely to adversely affect welfare during this period.*
27. Bitches must be introduced to their whelping accommodation no later than eight weeks after mating, or sooner if signs of imminent whelping are shown.	*The bitch needs to get used to the whelping environment. Once separated from other dogs there should be increased social contact with humans. Increased human contact will also ensure that the bitch is closely observed prior to whelping.*
28. There must be a separate whelping pen or room for each bitch in which to whelp.	*Bitches can become protective of puppies at whelping and this may result in aggression. Care should be taken by staff in approaching or handling bitches during this period, in addition to other dogs being kept away.*
29. Each whelping pen must be constructed of easily cleanable	*Both the bitch and puppies are more susceptible to disease around the time*

materials. The area must be cleaned regularly. An area must be provided within the whelping area where the bitch can rest away from her puppies.	*of whelping and the routine use of appropriate disinfectant is necessary. In a domestic environment where a room is used, covering existing flooring such as carpet or floor boards to enable regular cleaning is acceptable. Where a whelping kennel is used it must be constructed to the same standard as general kennels.*
30. There must be a whelping bed with sides high enough to prevent new-born puppies from falling out. The bed must contain bedding to ensure a soft surface for the bitch and to enable the absorption of mess resulting from whelping. The bed must be constructed of easily cleanable material and must be thoroughly cleaned and disinfected between litters.	*The use of wood is acceptable for a whelping bed as long as it has been treated to render it impervious with paint or varnish. Bedding should be of soft material that may be covered by absorbent material. The use of newspaper alone is not acceptable and sawdust and straw should not be used in whelping beds. The use of 'pig rails' to prevent a bitch lying on her puppies is advisable until puppies are well enough developed to be able to move out of the bitch's way.*
31. The whelping area must be maintained at an adequate temperature.	*Temperatures should normally be maintained between 26^{o}C and 32^{o}C. Where heat is provided by a heat lamp or a gas device, precautions should be taken to avoid excessive heat or contact with any flame, and there should be adequate ventilation to prevent the build-up of Carbon Monoxide and other noxious gases or vapours. Alarms should be provided.*
32. Bitches must be constantly supervised during and immediately after whelping and records kept of: a. Time of birth and identification of each puppy; b. Puppies' sex and colour; c. Placentae passed; d. Any other significant events.	*Accurate records are essential in the event of any difficulty. A paper record, a summary of which is transposed to the full veterinary record later, is acceptable. The person supervising must be aware of the signs of abnormal whelping.*
33. Bitches must be allowed a minimum of four periods a day for toileting and exercise away from their puppies.	*Bitches should be allowed out without contact with other dogs and for short periods from a few days after whelping.*
34. Puppies must be handled regularly from shortly after birth to habituate them to human contact and to examine them for any sign of	*Handling should consist of gently picking up and examining each puppy. This*

disease and to ensure they are feeding properly.	*should be done at least twice daily. Care should be taken as bitches may be anxious or potentially aggressive when puppies are approached.*
35. Records must be kept for all puppies and kept for 10 years detailing: a. Date of birth, sex, colour and any other identifying marks; b. Weight weekly until sold or at six months of age; c. All veterinary treatment.	*Good records are essential to monitor puppies' health and development. A copy of the records should be given to the purchaser.*
36. Puppies must start the weaning process as soon as they are capable of ingesting food on their own. The food offered must be appropriate for the stage of development of the puppies.	*Weaning should normally commence at 3-4 weeks old. The initial diet may be liquid progressing to solid food over the ensuing period.*
37. Puppies at weaning must initially be offered food five times a day. It must be ensured that each puppy takes the correct share of the food offered.	*Feeding five times a day at the start of weaning is necessary to allow adequate food intake and may be reduced to four times a day at about 6 weeks. Monitoring weight gain is important.*
38. Breeders must provide puppies with adequate socialisation and habituation from no later than 3 weeks through to point of sale.	*From early life puppies should be habituated to events likely to be encountered on homing to a domestic environment. This should include the sights and sounds in households, such as appliances, as well as differing surfaces on which to walk. Introduction to novel sights and sounds should be gradual so that puppies do not show a fearful response such as being startled or withdrawing. In a domestic environment this may occur naturally whereas in a kennel sights and sounds should be introduced in a structured manner. Recordings of sounds likely to cause fear when first encountered later in life, such as firework and traffic noises, should be introduced at a low volume. TV and radio may also be useful. An SOP for this purpose should be in place.* *Puppies should be introduced to a variety of people including adults of both sexes, children of different ages, and wearing a variety of clothing styles. Both adults and children should be used to interacting with dogs and their*

	interaction should be calm and consistent such that the experience is positive for the puppy. *Puppies should be provided with environmental enrichment by the provision of toys and a complex environment. Toys to chew and places to hide under and behind should be provided.*
39. Puppies must be maintained as a litter or with puppies of a similar age and size. However puppies must be separated from litter mates and the bitch for short periods from the age of six weeks. During periods of separation there must be human social contact.	*Puppies should be separated to habituate them prior to re-homing. Periods of separation should initially be very short, such that puppies do not show signs of distress, and the period of separation gradually increased.*
40. Puppies must be permanently identified and registered on a recognised national database prior to sale by a person trained in the appropriate technique. The identification number must be shown on all documentation.	*Microchip is the preferred means of identification and should be implanted by a trained person*[4]*.*
41. Puppies must be examined by a veterinary surgeon prior to sale. Veterinary advice in the establishment health plan must include the routine for treating puppies' internal and external parasites and vaccination regime.	*The examination should be limited to a simple physical examination and should be recorded in the puppy's treatment record. Where vaccinations are undertaken a completed vaccination certificate should be provided. This examination should not preclude an examination by the purchaser's veterinary surgeon shortly after acquisition.*
SALE	
42. A register must be maintained and kept for 10 years of all puppies sold showing: a. The name and contact details of the purchaser; b. The puppy's identification number;	*Records may be an integral part of the breeders' records and may be kept manually or on computer.*

[4] Trained person is a veterinary surgeon, veterinary nurse or a person trained to the Microchip Advisory Group standard available in the Code of Practice at www.bsava.com/LinkClick.aspx?fileticket=4gFweQEUACU%3d&tabid=154&mid=3021

c. The date of sale.	
43. Puppies must not be sold before the age of 8 weeks unless a veterinary surgeon certifies that they are fit to be re-homed.	*Early sale should only be authorised when it is for the benefit of the puppy's health or welfare. There should be some assurance that the puppy's environment will be appropriate.*
44. Potential purchasers of puppies must be vetted to ensure that they will be able to provide a suitable home and that they are committed to caring for the puppy for the whole of its life.	*The breeder should ask about the potential purchaser's lifestyle and availability of resources to properly care for the puppy for the whole of its life. A certificate from a veterinary surgeon who knows the purchaser may be a useful means of monitoring.*
45. The purchaser must be given a copy of all relevant records relating to the puppy including: a. The pedigree showing five generations including for cross-breeds when possible; b. Treatment records; c. Vaccination certificate when given; d. Veterinary health check results; e. Results of all health tests on both parents and the puppy where appropriate; f. Microchip (or other permanent identification) certificate; g. Kennel Club or other registration certificate.	*These should form an integral element of the 'puppy pack'.*
46. The breeder must also supply: a. The puppy's feeding regime with sufficient of the food for 5 days; b. Temporary health insurance; c. Advice on training and socialisation; d. Advice on special care such as grooming where appropriate; e. A puppy contract; f. Breeder's contact details.	*A puppy contract is available from the BVA AWF and RSPCA. Advice on training and socialisation should be up to date and welfare compatible, and should not include information on outdated concepts such as 'status reduction' nor advice to use punitive or coercive training techniques.* *At the time of sale, the breeder should demonstrate willingness to accept back, or assist in re-homing, any dogs bred and sold, by the breeder, to the purchaser, which can no longer be cared for by the purchaser.*

MANAGEMENT	
47. Numbers of staff must be appropriate for the breed/type and number of dogs being bred. Numbers must be sufficient to provide the level of care set out in paragraphs 4, 10, 11, 12, 14, 17,31, 32, 33, 34, 36, 37, 38, 39, 41, and 46.	*Owing to the significant variation in workload between breeds and numbers of litters it is not possible to set a minimum staff : dog ratio. Establishing the number of staff required will require an assessment of the conditions at the establishment. In domestic environments, it is advisable for either other members of the household, or dog sitters to be provided with guidance notes in regard to general day to day care - feeding, grooming, cleaning, exercise and compatibility issues - especially where several dogs, or breeds of dog, are involved.*
48. Where staff is employed there must be an induction and training SOP. There must be some continuation training.	*This should detail exactly what members of staff are required to do with all the dogs on site and provide sufficient knowledge to allow the staff to undertake their duties competently. In domestic environments the daily routine referred to above will be appropriate.*
49. Where the number of dogs is large enough to require staff other than the immediate family of the owner (generally spouse) to be used for their care, at least one member of staff must be a suitably qualified or experienced person.	*There are a number of nationally recognised relevant qualifications available.*
50. Where staff is employed, there must be separate washing, toilet and eating facilities.	*Staff should not be using areas used for preparing dog's food for their own purposes. In a domestic situation, the use of the normal household facilities is suitable with appropriate hygiene measures in place.*

Response from the Kennel Club as to how the Kennel Club's Assured Breeder Scheme aligns with Professor Bateson's recommendations

a. *All pre-mating tests for inherited disease appropriate to the breed or breeds are undertaken on both parents.*

KC ABS Standard 5.2 refers

b. *No mating takes place if the tests indicate that it would be inadvisable in the sense that it is likely to produce welfare problems in the offspring and/or is inadvisable in the context of a relevant breeding strategy (see also 2).*

KC ABS Standard 5.2 refers

c. *Any prospective purchaser is able to view the puppies with their mother.*

KC ABS Standard 6.10 refers

d. *Every puppy is identified by microchip prior to sale.*

KC ABS Standard 4.4 refers

e. *All pre-sale tests on the puppy which are appropriate to the breed have been carried out.*

KC ABS Standard 5.2 refers

f. *The scheme establishes and requires clear, written standards of management with regard to the housing, health, exercising and socialising of all dogs on the premises managed by the registered breeder, including establishing minimum staffing levels appropriate to the numbers of dogs involved.*

KC ABS Standard 3.2, 3.2, 4.5 and 4.7 refer

g. *All relevant documentation connected with the puppy including, inter alia, advice on feeding and care, registration documents, details of vaccinations etc. are handed over to the purchaser at the time of sale. When an appropriate contract is available this should be signed by both parties.*

KC ABS Standard 6.4, 6.5 and 6.6 refer

h. *All assured breeders are inspected by duly appointed and trained scheme inspectors against the written standard, either before or shortly after registration with the assurance scheme; and regularly thereafter.*

KC ABS Standard 1.1 and 1.3 refer

i. *Non-compliance with the standards of the scheme results in de-registration.*

KC ABS Standard 1.1, 1.3 and 2.3 refer

PUPPY VETERINARY HEALTH CHECK

The purpose of the puppy veterinary check is to identify any physical signs of disease or inherited defects that may be detected by a veterinary surgeon without a requirement for specialist equipment or knowledge[1]. The check will not detect some inherited defects and acquired defects that may manifest themselves later in life or may be affected by the environment in which the puppy is reared. It is therefore not a guarantee that the puppy is without any faults. The information given provides a record of the clinical examination conducted on the date specified below.

Microchip number[2]: | | | | | | | | | | | | | | | Sex[3] | M | MN | F | FN |

Puppy's Name and number[4]……

Breed: …… Colour: …… Date of birth: ……..

Breeder[5]: ……

Parameter[6]:			**Comments**[7]:
Body Condition[8] (1 to 5):			……
Demeanour:		Bright & alert/dull & unresponsive	……
Temperament:		Good/nervous/withdrawn/aggressive	……
Membranes:		Pink/pale/red/cyanosed/jaundiced	……
Skin:		Dry/greasy/crusting/parasites/folds[9]	……
Bite:		Overshot/undershot	……
Teeth:		Misaligned/missing / crowded	……
Palate:		Complete/cleft	……
Upper/lower eyelids:		Ectropion/entropion/distichiasis/trichiasis	……
3rd eyelid:		Kinked cartilage/prolapsed gland	……
Lacrimal		Tear staining/discharge/clean	……
Cornea:		Clear/opacities	……
Internal eye:		Clear/opacities[10]	……
Ears:		Discharge[11]	……
Heart:		Sinus rhythm/ irregular/murmur/thrill	……
Pulse:		Strong/weak/irregular	……
Circulation:		Good/poor	……
Chest:		Rounded/flattened	……
Lung sounds:		Clear/adventitious sounds	……
Hernias:		None detected/umbilical/inguinal	……
Abdomen:		Tense/guarded/relaxed	……
Testicles:		Two in scrotum/one/none	……
Anus:		Clean/soiled	……
Previous surgery[11]:		None declared	……

Signature of veterinary surgeon: ……

Name of veterinary surgeon: …… Date of clinical examination: ……

Address[12]: ……

PUPPY HEALTH CHECK GUIDANCE NOTES

1. This form is designed to be completed by a veterinary general practitioner using minimal equipment such as a pen torch and stethoscope.

2. The puppy must have been microchipped and scanned at the examination. The microchip may be implanted by the veterinary surgeon at the time of examination.

3. Neutering status as informed by the breeder.

4. Insert registered or pet name and any registration number.

5. Insert breeder's name and address.

6. Delete as appropriate and tick box when examined. NB ticking the box does not imply the parameter is normal.

7. Insert significant findings in the comments column. Continue on a separate sheet if necessary, including any additional observations.

8. Body condition scores*:

Score	Description
1	**Very thin**: Ribs, spine and hip bones easily seen; obvious loss of muscle bulk; no fat palpable under the skin.
2	**Thin**: Ribs, spine and hip bones easily seen; obvious waist and abdominal tuck; very little fat palpable under the skin.
3	**Ideal**: Ribs, spine and hip bones easily felt; visible waist with abdominal tuck; small amount of fat palpable under the skin.
4	**Overweight**: Ribs, spine and hip bones hard to feel; waist barely visible with a broad back; layer of fat on abdomen and at base of tail.
5	**Obese**: Ribs, spine and hip bones extremely difficult to feel under a thick layer of fat; no waist can be seen and abdomen may droop significantly; heavy fat pads on lower back and at the base of the tail.

*Courtesy of Pet Food Manufacturers' Association

9. Describe the quantity, nature, position and extent of any skin folds.

10. Anterior chamber / iris / pupil / lens / vitreous / retina (detachment).

11. Describe if present.

12. As declared by the breeder. If docked, note if a veterinary certificate is seen.

13. Append veterinary practice stamp

DEREGULATION BILL – SCHEDULE 20, PARAGRAPHS 31 AND 32

Breeding of Dogs Act 1973 (c. 60)

31 In section 1 of the Breeding of Dogs Act 1973 (licensing of breeding establishments for dogs), omit subsection (4)(i) (requirement for local authority, in determining whether to grant a licence, to have regard to the need for securing the keeping of accurate records).

32 (1) The following amendments are made in consequence of paragraph 31.

(2) In section 1 of the Breeding of Dogs Act 1973—

(a) at the end of subsection (4)(g), insert "and";

(b) omit the "and" following subsection (4)(h);

(c) in the closing words of subsection (4), for "paragraphs (a) to (i)" substitute "paragraphs (a) to (h)";

(d) omit subsection (4A)

(3) In the Breeding and Sale of Dogs (Welfare) Act 1999, omit section 2(3).

PAPER SUBMITTED TO THE CABINET OFFICE ON BEHALF OF THE ADVISORY COUNCIL ON THE WELFARE ISSUES OF DOG BREEDING ('THE DOG ADVISORY COUNCIL')

1. By virtue of an amendment agreed by the HC Public Bill Committee at its 14th Sitting, held on 18th March 2014, Schedule 20, Paragraphs 31 and 32, of the Deregulation Bill (as introduced into the House of Lords) provides that the requirement under the Breeding of Dogs Act 1973 for local authorities, when deciding whether to grant a dog breeding licence, to have regard to the need for securing that dog breeding records be kept in a prescribed form and to specify licence conditions to secure that objective, will be removed.

2. The Government's rationale is that this measure will no longer be necessary in consequence of the introduction of compulsory microchipping of dogs. In proposing the amendment, the Solicitor-General stated, at column 465:

> The repeal of section 1(4)(i) and (4A) of the Breeding of Dogs Act 1973 will remove an unnecessary burden on licensed dog breeders to record the details of their dogs in a prescribed way. From April 2016, all dogs in England—and from March 2015 all dogs in Wales—will be required to be identified by a

microchip, and the details of dog and owner will be recorded on a database. There will therefore no longer be a need for licensed dog breeders to go on recording details of their dogs in a prescribed form after April 2016, because they will already be doing so through the microchipping requirements, which I have described, and the database.

3. The Council is strongly in favour of compulsory microchipping. It is, however, important to distinguish between the objective of this policy and that underlying the Breeding of Dogs Act.

4. The introduction of compulsory microchipping is intended, first, to improve the chances of owner and dog being reunited should they become separated and, second, should the need arise, to enable the owner of a dog to be traced and held to account. Accordingly, the details which are recorded on the microchip database are restricted to: the name and address of the owner; the name of the dog; its breed, colour, gender, and date of birth.

5. In contrast, the Breeding of Dogs Act is intended to address the issue of indiscriminate over-breeding in circumstances which are likely to compromise the health and welfare of the dam and her puppies. Under the legislation, keeping a dog breeding establishment means the carrying on by a person at any premises, including a private dwelling, of a business of breeding dogs for sale. Under the 1973 Act a licence was required if at least three bitches were kept at premises by the person running the business. However, it proved to be too easy for unscrupulous commercial breeders to arrange their business (generally referred to as 'puppy farms') so that it did not fall within these criteria, and they were replaced with effect from 1 January 2000, by virtue of the Breeding and Sale of Dogs (Welfare) Act 1999.

6. In consequence, a person is now regarded as carrying on a business of breeding dogs for sale if (i) he keeps a single bitch at *any* premises for a period of twelve months, (ii) she gives birth to a litter of puppies during that period, and (iii) four or more other relevant litters are born during the same period. In assessing the number of litters born under the third head, account is taken of those born to the bitch initially mentioned in (i); any other bitches kept by the person at the same premises; any bitches kept there by a relative (as defined by the statute) of the person; any bitches kept by him at other premises; and any bitches kept anywhere by any person with whom he has made a breeding arrangement under which he is provided with puppies or any part of the proceeds from their sale.

7. For the same purpose, the licensing authority is required to have regard to the need for securing that: bitches are not mated if they are less than one year old; they do not give birth to more than six litters of puppies; and each litter must be at least a year apart.

8. It is self-evident from the foregoing that implementation and enforcement of the dog breeding legislation both focuses and relies on an accurate record of the number of litters produced and the identity of the dam.

9. To this end, the 1999 Act required that accurate records be kept in the prescribed form and be available for inspection, and the Secretary of State was placed under a duty to introduce regulations setting out the prescribed form, presently the Breeding of Dogs (Licensing Records) Regulations 1999, SI 1992/3192.

10. A copy of the prescribed form is reproduced at the end of this paper. It will be readily appreciated that it not only contains different information than that recorded on microchip databases, but is also in a format which is convenient for licensing authorities.

11. It follows that the information normally recorded on microchip databases is neither appropriate nor sufficient for local authorities to oversee the adherence to, and enforcement of, the dog breeding legislation, and microchipping is not in itself an adequate alternative to the existing legislative requirements, and the Council requests Ministers urgently to reconsider their decision to repeal the relevant provisions.

12. Indeed, not only is the Council of the view that the present prescribed form should be retained, but the required information should be extended to include the microchip number of the sire, the dam, and each puppy in the litter.

13. Further, while the Explanatory Notes accompanying the Bill state *"Any information that is not held by the database and that the local authority (as enforcers of the 1973 Act) considers is relevant to the welfare of the dogs, can be added as a condition of the individual dog breeder's licence"*, the Council has concluded that this arrangement does not constitute an adequate substitute for the existing position for two reasons. First, as has been explained, the information presently required is essential for any meaningful enforcement of the legislation and it should not therefore be left to local authorities to decide whether or not it is provided. Second, to have it presented in a clear and consistent manner is equally important for effective enforcement.

Advisory Council Review of Regulation – recommendations to Governments

Advice on the regulation of the breeding, supply, sale and advertising for sale of dogs.

EXECUTIVE SUMMARY

1. Current legislation on dog breeding does not adequately protect the welfare of dogs and is difficult to enforce within reasonable resource cost.

2. The Breeding of Dogs Act 1973, The Breeding of Dogs Act 1991 and the Breeding and Sale of Dogs (Welfare) Act 1999 should be repealed and replaced by regulations made under the Animal Welfare Acts.

3. The proposals for new regulations are based on the following principles:

   i. That self regulation should be employed to maximum effect and the regulations themselves are as light touch as is proportionate to the extent of the welfare problems being addressed.
   ii. That the ready identification of breeding premises and breeders, and accurate traceability of dogs back to their breeder, are key factors without which any proposed system will not be effective.
   iii. That the necessarily outline controls in the regulations should be amplified and supported by detailed statutory Codes of Practice where appropriate.

4. It is proposed that essential elements of the new regulations should:

   i. Impose new duties of care on all persons planning a mating of dogs and any organisation exercising public duties with regard to the establishment of Breed Standards.
   ii. If not already in place, create a requirement for dogs to be permanently identified, currently by Microchip, as put forward by the Microchipping Alliance.
   iii. Create a requirement for every person breeding a dog to register with their Local Authority, obtain a breeder's registration number, and provide their address and details of the veterinary practice with which their dogs are registered.
   iv. Require any advertisement for the sale or supply of any puppy or puppies to include the breeder's registration number.
   v. Oblige any person breeding two or more litters a year to obtain a dog breeding licence from their Local Authority.
   vi. Require all persons breeding a dog or dogs to comply with the Council's Standard for Breeding Dogs, which should become a statutory Code of Practice.
   vii. Facilitate enforcement activity on the basis of an informed risk assessment, enable enforcement authorities to recover the costs of managing the registration database and of enforcement visits to licensed premises, and provide for enforcement authorities to remove a dog breeding licence if the person or organisation concerned fails to comply with an Improvement or Care Notice issued under the Welfare Acts.
   viii. Prohibit the sale, supply or gifting of any dog which
      a. is less than 8 weeks old;
      b. has not been micro-chipped.
   ix. Also prohibit the sale, supply or gifting of any dog unless holding a current breeder's registration number with the relevant Local Authority, and prohibit the sale, supply or

gifting of a dog to anyone other than a recognised rehoming organisation or a licensed pet shop, who is known, or believed, to be planning to sell or gift the dog to a third party.

x. Require all licensed pet shops selling dogs to observe the standards established in a statutory Code of Practice.

5. The Council also makes some recommendations with regard to possible non-statutory approaches to support improvements in welfare standards.

Discussion

Introduction

1. In 2010 both the APGAW and Bateson reports[5] identified a need for improved regulation and/or the improved enforcement of regulation with respect to dog breeding and the welfare issues associated with it. Specifically, they identified a number of areas where human behaviours need to change if the duty of care established in the Animal Welfare Acts[6] is to be reliably fulfilled for dogs. These include:

a. Negligent and/or ignorant breeding practices (on large or small scales) which compromise the health and welfare of the parent dogs and/or the puppies;

b. The deliberate breeding and conditioning of dogs for illegal or anti-social purposes which renders them unsuitable for human society;

c. The sale and transport of dogs (including their importation) in conditions which do not fulfil their welfare requirements as defined in the Welfare Acts and other legislation such as the EU Transport Regulation 1/2005;

d. The advertising, sale and purchase of dogs in conditions and by individuals who take insufficient care to ensure that a dog and prospective owner are well-matched in both expectations and requirements and likely to form a partnership which is beneficial to all concerned for the duration of the dog's life.

2. In carrying out its review the Council has been mindful that Government policy is strongly in favour of de-regulation where possible and, that where regulation is deemed necessary, it should be as light in touch as is commensurate with achieving its aims. The possibilities of self regulation, guidelines, and both statutory and non-statutory Codes of Practice have been explored. The Council accepts that legislation is the last resort, only used where a change in behaviours cannot be achieved by other means. The Council is also conscious that if action is to be effective, any statutory intervention designed to change public behaviours and standards needs:

a. To enjoy public support for action to be taken;

b. To be capable of being enforced effectively and with maximum resource efficiency.

3. Regarding public support for a need for intervention in this area, the Council has observed that:

a. There is widespread public concern about the poor welfare of some dogs used for

[5] Associate Parliamentary Group for Animal Welfare: A healthier future for pedigree dogs (2009) Bateson P: Independent Inquiry into Dog Breeding (2010)

[6] Animal Health and Welfare (Scotland) Act 2006, Animal Welfare Act 2006, Welfare of Animals Act (Northern Ireland) 2011

breeding and well-informed support for action to impose improved standards on large scale poorly run commercial enterprises, or so-called 'puppy farms'. However there seems little recognition by the wider public that some of its own actions (purchasing puppies from such breeders) is helping to perpetuate the problem.

b. There is also vocal support for action to resolve the problems of inbreeding and selection for extreme characteristics. It is less obvious that there is a clear recognition of the need for action amongst all those most directly affected (ie the pedigree breeders and those representing them).

c. It has been argued that the veterinary profession can be conflicted to some degree because the profession earns income from the surgical correction or clinical mitigation of the problems caused by poor breeding. However it is also the case that these interventions do not form a significant proportion of the income of most veterinary practices and the majority of veterinary surgeons are happy to promote improved preventative measures by advising prospective breeders. Senior representatives of the profession and recent veterinary research papers and reviews have all attested to significant professional concern about the impact of genetic conditions and breed related problems. There is a generally shared view that veterinary surgeons should be encouraged to be, and be seen to be, more pro-active in the prevention of poor welfare and the promotion of good welfare.

4. In conclusion, the Council believes that there is persuasive evidence both that action is necessary to address the welfare problems which have been clearly identified, and that the level of public concern and the inadequacies of the existing controls over dog breeding justify the making of new, more effective and more resource efficient regulations under the Animal Welfare Acts. The Council also believes that regulation is not the only means of improving welfare standards and that any statutory action should be supported by non-statutory means including self-regulation.

Recommendations

Non Statutory Action

Recommendation 1

1.1 **The Royal College of Veterinary Surgeons should be asked to consider how best to require veterinary surgeons to advise on breeding issues and be accountable for that advice. Examples of areas which might be included would be a requirement to carry out pre-breeding and puppy health checks to an appropriate standard; or if involved in a breeding establishment, being aware of the Standard for Breeding Dogs and able to advise on how the Standard can be met.**

1.2 A duty should also be laid on veterinary surgeons to report surgical changes of conformation (as defined) and Caesarean sections in any dog to the appropriate body; ie SAVSNET or VetCompass. For Kennel Club registered dogs this information should also be reported to the Kennel Club. Information on animals which have had surgical correction or Caesarean section should be available to potential purchasers (see the Puppy Contract http://puppycontract.rspca.org.uk/webContent/staticImages/Microsites/PuppyContract/Downloads/PuppyContractDownload.pdf) and sanctions or restrictions should relate both to future breeding if appropriate. (see the Standard for Breeding Dogs – also referred to in the document as "the Standard")

1.3 The Council recognises that these issues raise concerns about client confidentiality and may be too detailed for inclusion in the Code of Professional Conduct for Veterinary Surgeons and might more properly be addressed in an annex to the Code.

1.4 There would also need to be a reciprocal responsibility on the part of anyone involved in dog breeding to consult their veterinary surgeon on matters relating to breeding and be prepared to pay for proportionate pre-breeding and puppy health-checks. These matters are covered in the Council's Standard for Breeding Dogs and in the Council's Puppy Health-check form and guidance.

Explanation:
1.5 Many bodies have noted a need for the veterinary profession to become more pro-active in the encouragement and support of preventative measures to reduce the challenges to dog health and welfare. The Council consider that this route would be the most efficacious, and would be happy to work with the Royal College of Veterinary Surgeons on a draft for consideration. Since the Royal College of Veterinary Surgeons is the expert body responsible for the Code, the Council would be happy to take its advice on the most appropriate means of achieving the desired end. The changes of conformation to be reported would also require definition (see British Veterinary Association List).

Statutory Action

Recommendation 2
2.1 **The Breeding of Dogs Act 1973, The Breeding of Dogs Act 1991 and the Breeding and Sale of Dogs (Welfare) Act 1999 should be repealed and replaced by new regulations made under the Welfare Acts. The new regulations should encompass the breeding, advertising, sale and supply of dogs.**

Explanation:
2.2 This would enable the replacement of three items of elderly primary legislation with a single set of new secondary regulations designed to be clear in the duties they impose and easy (cost-effective) to enforce.

2.3 The existing legislative controls have proved difficult to enforce because of the difficulty in detecting un-licensed breeders and of lack of precision in the standards they set. For example, The Breeding of Dogs Act 1973 includes a number of conditions that an authority is required to ensure before granting a licence (see Section 1(4)). These include, amongst others, that there should be accommodation that is 'suitable' with respect to aspects such as construction, ventilation, cleanliness and exercise facilities. It also requires that dogs be supplied with 'suitable' bedding, food and water and that they are 'adequately exercised'. Further, the Act requires, with respect to health, that precautions should be taken to prevent spread of infectious disease. Local Authorities have drawn up licence conditions based on these requirements. The criteria are very limited, inadequately defined, and do not reflect the range of needs specified in the Animal Welfare Acts. Local Authority licence conditions emphasise structural features of the environment, but most often very limited attention has been paid to the behavioural needs of dogs, and 'exercise facilities' and 'suitable accommodation' has been interpreted very narrowly. While some guidance was provided separately in 2000 (devised by a working party comprising the British Veterinary Association, the British Small Animal Veterinary Association, the Local Government Association and the Chartered Institute of Environmental Health) which could have aided interpretation of criteria, the helpful advice in the document has been widely disregarded as it is not statutory.

2.4 Similarly, The Breeding and Sale of Dogs (Welfare) Act 1999, which amends the 1973 Act introduced additional requirements that breeding bitches should not be bred from prior to age 12 months, more than once in any 12 month period, and no more than six times. While these criteria are pertinent, they are very difficult to enforce by Local Authorities without adequate identifying details (e.g. microchip numbers) and full records, and have existed primarily on paper.

2.5 These two Acts, and the associated 1991 Act, which gave additional powers of entry, were implemented prior to the Animal Welfare Acts. The Animal Welfare Acts, in principle, create additional over-arching criteria that are relevant to the welfare of breeding dogs, including the provision of the dogs' needs to have a suitable environment, their need for a suitable diet, their need to be able to exhibit normal behaviour patterns, their need to be housed with [or apart from] other animals, and their need to be protected from pain, suffering, injury and disease – to the extent of 'good practice'. While the Breeding of Dogs Act criteria if properly followed should ensure the needs for a suitable environment and diet are met, they do not explicitly address the need to be housed with other dogs and they allow, for example, dogs to be kept in isolation, without providing scope for adequate rest or separation from other dogs when wanted and lack of interaction with carers, all of which may lead to distress. The extant regulations effectively do not require that the many health problems occurring are addressed – including treatment for injury, neoplasia, eye, ear and mouth infection or treatment for parasitic infestation (both endoparasites and ectoparasites). The regulations only require that steps should be taken to prevent spread of infectious disease. The breeding regulations do not require opportunities for expression of normal behaviour patterns – reference to exercise facilities have commonly been met by access to small, barren mesh 'runs' linked to the kennel. The regulations also create no expectations of appropriate socialisation of puppies. While the Animal Welfare Acts do imply these additional requirements, many authorities have chosen not to enforce them, with the consequence that large numbers of breeders are 'licensed' yet may be in breach of one or more of the Acts provisions. The Council's proposals seek to address these issues.

2.6 As matters stand, the legislation applies to a person carrying on a business of breeding dogs, which is defined as producing five or more litters a year. However, a breeder producing only four litters, for example, might produce up to 40 puppies per year yet be exempt from scrutiny. Moreover, the Council is strongly of the view that ***all*** *dogs, whether bred commercially or simply as a hobby in a private home, are entitled to good standards of health and welfare and to the full protection of the Animal Welfare Acts.*

2.7 The Breeding and Sale of Dogs (Welfare) Act, 1999 additionally seeks to address matters of sale. Since there has been a significant problem of sale of dogs via third-parties – most particularly 'dealers' – the Act specified that a licensed breeder may not sell knowingly to a third-party who in turn sells on. This was qualified so that such a sale could occur if the third-party had a 'pet shop licence'. These regulations have had no effect whatsoever in restricting sales to third-parties. First, monitoring of the disposal of puppies has been inadequate; indeed, arguably non-existent. Second, licences for 'pet shops' have been readily obtained by dealers without pet shop premises and monitoring of their standards has been exceptionally lax. Third, the current lack of traceability of breeders and puppies makes avoidance of these provisions easy. A large proportion of commercial dog breeders, particularly those with the lowest standards, sell through dealers. Amongst other things, this precludes the opportunity for a purchaser to see a puppy with its parents as is advised. There have only been three prosecutions under this Act since it was made in 1999.

2.8 The nature of puppy sales has changed over the last two decades. A very substantial proportion of puppies are now sold over the Internet. Most Internet sellers simply present the details of the puppies. Often sellers provide no verifiable contact details, relying on a mobile phone number and 'delivery' of a puppy. This source of sales is currently unregulated and is a primary avenue by which puppy farmers sell puppies. The regulations relating to sale of dogs and puppies are therefore in urgent need of review.

2.9 The detailed proposals below relating to the new regulations aim to extend the practical protection of the Animal Welfare Acts to all dogs, simplify the identification and traceability of breeders, facilitate the targeting of enforcement action on the basis of risk and, as far as possible, align proposals across the different administrations within the UK.

Recommendation 3

3.1 The new regulations should create clear duties of care as follows:

a. All persons or organisations planning a mating of dogs should be required to have regard to the welfare of their animals and those that result from the mating.

b. Any organisation or body devising and/or promulgating Breed Standards should be required to have a duty of care with regard to the welfare of the animals to which the standard is applicable.

Explanation:

3.2 At present the duty of care in the Welfare Acts does not apply to animals in the foetal or embryonic state, nor to animals not yet in existence. However the Welfare Acts specifically provide a power to make regulations "for the purpose of promoting the welfare of animals for which a person is responsible, or the progeny of such animals." The Council believes that in making decisions regarding the mating of dogs, those responsible should also have a duty of care to the progeny that will result from the mating. For example, in some dog breeds or cross breeds the prevalence of specific heritable problems is high and there are well understood genetic tests for the problems, such that where the mating of specific parents is contra-indicated any such mating could be regarded as negligent with respect to the welfare of the resulting progeny. Equally, where the selection for extremes of conformation has resulted in welfare problems, any further selection which makes the problem worse, or does not seek to improve the conformation in the progeny, should be avoided. A similar provision relating to a duty of care for progeny already exists in other legislation with respect to farm animals. It is intended that this duty of care should apply to those who make the decisions with regard to a mating such as selecting the parents. It is not intended to apply to those who may subsequently acquire responsibility for the care of a pregnant bitch, eg re-homing or rescue organisations.

3.3 Any organisation or body can set themselves up as establishing Breed Standards. Currently in the UK this role is overwhelmingly exercised by the Kennel Club and Breed Clubs, such that they exercise considerable influence over the welfare of dogs bred to their rules. The Council considers it likely that some of the non-Kennel Club registered designer breeds such as Labradoodles, will also develop Standards. Any such organisation should have a duty of care for the welfare of the animals for which the Standard was set, recognising that such a duty could extend only to what was contained in the Breed Standard, rather than to the enforcement of compliance with the standard.

3.4 The Council would also propose that any person or organisation which publishes a breed or similar standard for the guidance of breeders and other keepers of a particular type of dog is properly to be regarded as exercising a power of a public nature. As such, the Council considers that they should be placed under a specific legal duty in drawing up and applying

standards to make the welfare of the dogs concerned their primary consideration. The exercise of this duty should fall within the supervisory jurisdiction of the courts. This would be a civil, not a criminal, matter, and subject to the same range of remedies as are generally available through the judicial review procedure. The Council recognises that this recommendation is opposed by the Kennel Club on the basis that "it is clearly not a public body and there is no legislative requirement for any dog breeder to follow its recommendations." However, the Council also notes that the Kennel Club has sought exemption from Local Authority enforcement inspections in Wales for those breeders who are members of the Kennel Club Assured Breeder Scheme and in those circumstances would be exercising a public role with respect to the maintenance of statutory standards. After due consideration the Council therefore stands by its original recommendation for two reasons. First, if a body is exercising what is in effect a public function it should be open to the possibility of public scrutiny and accountability. Second, while the Council recognises that the Kennel Club has accepted that it should and does exercise a duty of care with respect to Breed Standards, not every such body may be so responsible and it is poor practice to design legislation to deal only with the circumstances of one particular organisation.

Recommendation 4

4.1 If not already in place the microchipping regulations as put forward by the Microchipping Alliance should be incorporated into these new regulations.

4.2 Consideration should be given to providing guidance, perhaps via a Code of Practice, on how dogs may be microchipped, covering such matters as where (ie the site on the dog), the level of qualification and/or training required of the operator and the data to be held on microchip database(s).

Explanation

4.3 Recommendations 4 and 5 (below) both relate to traceability. It is the Council's contention that effective traceability of both individual dogs and of dog breeders is fundamental to effective regulation. It should be noted that the requirement for identification of puppies must include registration on the database of the breeder's details.

4.4 It is a matter of concern that there is as yet no clear guidance on where (anatomically) dogs can best be micro-chipped, nor on who should be allowed to do it and, if this extends beyond veterinary surgeons and veterinary nurses whose competence can be enforced, how they should be trained and qualified in order to avoid welfare problems. The Council considers that these issues should be addressed as a matter of urgency and would be willing to assist.

Recommendation 5

5.1 Any person or organisation breeding a dog or dogs should be required to register their address and contact details with their Local Authority, which will enter them on a database and allot them a unique identifying registration number. Such a registration would remain valid as long as the responsible person or organisation keeps the same name and remains at the same address. It should be open to the Local Authority to permit a registered person or organisation to retain their unique identifying number on change of name and/or address provided the changes are transparent and traceable. The act of registration will also constitute the granting of a right of access to enforcement inspectors. The Local Authority should be permitted to charge for registration, sufficient to cover their costs.

5.2 For those breeding only a single, occasional litter of puppies, this simple registration would be the only formal notification of breeding required by law. However this is key to ensuring the identification and traceability of all persons breeding dogs, to Recommendations 6, 7 and 8 below and to many enforcement issues.

Explanation

5.3 With respect to breeders, the requirement for registration should apply to any breeding of any number of dogs whether deliberate or accidental. As stated above, the Council's view is that the duty of care in the Welfare Acts and the new duty of care in the proposed regulations do and should apply to all dogs used for breeding. It is not acceptable for a dog to be bred in any way which damages its health or welfare simply because the owner is a 'hobby' breeder. The requirement for registration should therefore apply to all (see also proposed definitions below.) On the other hand, requirements for enforcement action following registration should be judged according to a risk assessment – see further recommendations below.

5.4 This has elicited considerable discussion during consultations on the Council's recommendations. It was generally agreed that the identification of all breeders was important and that there should be a database that identified all breeders. An alternative proposal put forward was that this could be achieved through the microchip databases as this would record the original breeder in every instance and concern was expressed in a number of quarters about the burden of maintaining such a database which this would impose on Local Authorities. The Council has considered these views at length and takes seriously the issue of Local Authority resource. However, it concluded that many of the concerns expressed were based on a misunderstanding of what the Council had in mind.

The Council's vision is that every breeder would be required to register with their Local Authority. This could be done on-line through the completion of a simple on-line form and the payment of a nominal fee. All the Local Authority would need to do is:

- *Make available an on-line registration and charging facility;*
- *Maintain their area register and make it publicly available – also on-line.*

All the breeder would need to do is to enter some basic details such as name, address, contact details, and address of the veterinary practice with which the dogs were registered and pay a nominal fee. They would be allocated a registration number which they would be required to use when, for example, advertising or selling any puppies.

5.5 The benefits would include

- *a publicly available Local Authority list,*
- *the opportunity for the Local Authority to cover the database costs by charging for registration*
- *The ready identification of local breeding establishments for the benefit of enforcement officers*
- *The possibility for anyone, enforcement officer, member of the public, advertising authority etc to check that a registration number provided when advertising, selling or even micro-chipping a puppy is valid.*

5.6 Those involved in larger scale breeding would also be required to have a dog breeding licence – see Recommendation 7

Recommendation 6

6.1 Any person or organisation breeding a dog or dogs should be required to register their dogs with a veterinary practice and to supply the latter's contact details to the Local Authority as part of the registration process.

6.2 Explanation: The Council regards access to appropriate specialist advice and veterinary assistance as key to welfare-friendly breeding practices. It would recommend that all dogs should be registered with a veterinary practice, not just those being bred from, but on balance considered that it might not be proportionate to require such general registration by regulation. If governments felt differently the Council would be delighted to support such a move.

Recommendation 7

7.1 In addition to the simple registration of all breeders recommended above, regulations should require all breeders breeding commercially to obtain a dog breeding licence from their Local Authority.

7.2 Local Authorities should be enabled to recover the costs of licensing from the licensees.

7.3 Licensed dog breeding premises would, of course, be subject to all other recommendations in this paper, with particular respect to compliance with a Standard for Breeding Dogs which has been deliberately designed to facilitate robust inspection of compliance with clear and measurable requirements. It is anticipated that, subject to all conditions being met, a dog breeding licence would remain valid for three years and would be renewable.

Explanation

7.4 The Council has given serious consideration to the need or otherwise for continuing licensing provisions in addition to the registration requirement articulated above. It has listened to the feedback from stakeholders, with particular regard to the need for a more formal inspection regime relating to dogs being bred commercially and/or with greater frequency. It has also taken on board points made respecting the benefit of maintaining as much consistency as possible between various parts of the United Kingdom and the early advances made by the Welsh Assembly.

7.5 To ease enforcement across different areas of the UK, the Council therefore would recommend aligning the definition of commercial dog breeder (or dog breeder requiring licensing) with that adopted in the Welsh regulations, since at the time of drafting these are the most developed. In the most recent available draft of the Welsh regulations a breeder requiring licensing is defined as follows:

"A person carries on the activity of dog breeding for the purposes of section 13(1) of the Act if that person keeps on premises 3 or more breeding bitches and —
breeds on those premises 3 or more litters of puppies in any 12 month period;
advertises for sale from those premises a puppy or puppies born from 3 or more litters of puppies for sale in any 12 month period;
supplies from those premises a puppy or puppies born from 3 or more litters of puppies in any 12 month period;
advertises a business of breeding or selling dogs from those premises; or
occupies premises which benefit from a planning consent authorising dog breeding.
For the purposes of paragraph (1) any dog found on the premises will be presumed to be kept by the occupier of those premises until the contrary is proved."

Recommendation 8

8.1 Any advertisement for the sale or supply of a dog or dogs should be required to include the breeder's registration number, the registered address, and the advice that a puppy should be seen interacting with its dam before purchase.

8.2 It should be an offence for any person or organisation or a licensed pet shop to advertise the sale or supply, whether for benefit or not, of a dog unless the above requirements are met.

Explanation

8.3 A further element in the traceability requirement, this provision also provides a first point of enforcement – see below. It also supports organisations that provide advertising services, both electronic and in print, that wish to do so responsibly and exclude irresponsible and/or unregulated breeders. The ability to check the veracity of a breeder's status easily is an important filter for them.

Recommendation 9

9.1 All persons or organisations breeding dogs should be required to comply with the Standard for Breeding Dogs.

Recommendation 10

10.1 The Standard referred to above should be established as a statutory Code of Practice for breeding dogs.

Explanation:

10.2 The Welfare Acts already create a duty of care such that "a person commits an offence if he does not take such steps as are reasonable in all the circumstances to ensure that the needs of an animal for which he is responsible are met to the extent required by good practice." The Council would argue that its published Standard for Breeding Dogs (the Standard) is the statement of what is good practice for this group of animal keepers (ie dog breeders). The Standard therefore provides the basis for effective enforcement. In addition, the Standard includes or supersedes the licence provisions currently set out in the Breeding of Dogs Act 1973 as amended.

10.3 The Welfare Acts also contain a specific provision enabling the appropriate national authority to issue and revise Codes of Practice. Replacing the current, out-of-date and inflexible primary legislation with regulations and a Code of Practice would provide a far more flexible and light touch means of providing practical guidance on how the provisions in the Act can be met.

10.4 In addition, one of the difficulties in enforcing the existing primary legislation is that many of the provisions are inexact and require the exercise of professional judgment by enforcement officers who may not be veterinary surgeons. For breeders whose operations will depend on being registered with a Local Authority, Local Authority enforcement officers who undertake inspections and enforcement visits will need to be able to rely on very clear criteria to have a basis for suspending or refusing licensing, or for issuing Improvement or Prohibition notices. The Council's Standard is drafted in order to provide explicit and measurable standards and its endorsement as a statutory Code of Practice would facilitate effective enforcement. As with any statutory code, failure to comply with a relevant provision may be relied upon by an enforcement authority as tending to establish liability and could be used to support the issue of an Improvement Notice or a prosecution under the Act. Equally, from the breeder's point of view, compliance with the Code confers some protection as compliance with a relevant provision may be relied upon as tending to negative liability.

10.5 This proposal has received wide support, noting that recent work between the Council and the Kennel Club has succeeded in aligning the Kennel Club Assured Breeder Scheme Standard with the Council Standard and that the Kennel Club has expressed itself willing to work towards a Single Standard. As the Kennel Club Scheme is currently the only one with UKAS accreditation for its inspection scheme this was seen by the Council as a very positive development.

Recommendation 11 – risk based enforcement

11.1 The regulation should facilitate enforcement activity on the basis of an informed risk assessment.

11.2 Enforcement authorities should be enabled to charge for activities such as the registration of dog breeders and the carrying out of enforcement visits on a cost recovery basis. The structure of the fees system should reflect the level of dog breeding activity being undertaken and the risk of non-compliance leading to risk based inspection.

11.3 Enforcement authorities should be enabled to remove a licence from any person or organisation breeding a dog or dogs if they fail to comply with an Improvement Notice issued under the Welfare Acts.

11.4 The regulation should provide for enforcement visits to licensed premises to be unannounced where the Local Authority enforcement officers consider it appropriate.

Explanation

11.5 Whether in the text of the regulation itself or in supplementary non-statutory measures, the Council believes that the hard-pressed enforcement authorities should be enabled to focus enforcement activity where it is most needed and where it will deliver the maximum benefit for cost incurred. The application of focussed enforcement activity should also encourage the public to embrace non-statutory schemes which deliver good standards of welfare. All inspections should be done on a risk basis and (as is the case for food inspections and safety inspections) the risk assessment should be based on size, degree of activity, past performance, number of complaints and membership of an appropriate quality assurance scheme. When completing such an assessment, being a member of an Assured Breeders Scheme would be one additional factor that is taken into account. It should not automatically confer a complete exemption from inspection.

*11.6 The primary requirement in respect of the assurance provided by appropriate non-statutory schemes is that the relative risk posed by an assured premises is significantly reduced **provided** the breeder(s) are members of a United Kingdom Accredited Service (UKAS) inspection scheme which inspects to the required Standard (or Code of Practice), and have successfully passed an inspection. Such inspections should be at least annual and in the case of licensed premises should preferably be unannounced.*

11.7 In addition to breeders who have not passed accredited inspections, enforcement visits should be prioritised to:

- *any breeder (whether registered or licensed) against whom a valid complaint has been made;*
- *any breeder who has failed an accredited inspection and is not currently undertaking improvement action;*

- *any unregistered breeder who comes to the attention of the Local Authority, for example by advertising a dog for sale when not registered;*
- *licensed breeders who are not members of an accredited inspection scheme inspecting to the approved Standard **and** have not been inspected within the last 12 months. The Council would also strongly encourage the active use by enforcement authorities of the powers to impose Improvement Notices which are provided in the Welfare Acts.*

Recommendation 12 – Definitions

12.1 "a person responsible for an animal" should be interpreted as set out in the Welfare Acts.

"a person or organisation which has bred a dog or dogs" should be defined as any person responsible for a dog who has:

- **bred at least one litter of puppies within the last 12 months;**

Explanation:

12.2 The definition is intended to cover any person who has bred, or who may be intending to breed, puppies within a 12 month period for the reasons explained above. In addition, one of the problems of enforcing the existing breeding of dogs legislation has been the difficulty of proving whether a qualifying number of litters is, or is going to be, bred during the qualifying period. Changing the definition to include anyone who has bred a dog resolves that problem.

Recommendation 13 – sale of dogs

13.1 Assuming Recommendation 2 is accepted, the provisions relating to the sale of dogs in the Breeding and Sale of Dogs (Welfare) Act 1999 will be repealed. The Council recommends that these provisions should be replaced with regulations which make it an offence for any responsible breeder:

a. to sell or supply for sale or gift a dog which is less than eight weeks old.

b. to sell or supply for sale or gift a dog otherwise than to a recognised rehoming organisation or to the keeper of a licensed pet shop, knowing or believing that the person who acquires it intends that it should be sold or gifted by him or any other person.

c. to sell or supply for sale or gift any dog which, when delivered, has not been microchipped (or otherwise permanently identified by an approved method) and its identification details (including details of the original breeder and the current owner) entered onto an approved database.

13.2 It should be an offence for any person or organisation breeding a dog or dogs to sell or supply for sale or gift any dog unless holding a current registration with the relevant Local Authority and, if appropriate, a current dog breeding licence. (see recommendations 5. and 7.)

13.3 Further, the Council recommends that the Codes of Practice relating to the Breeding of Dogs and the Sale of Dogs (see Recommendation 14 below) should make clear that anyone offering a dog for sale or gift must not keep it isolated from others of its species unless a certificate supplied by a veterinary surgeon states that it is necessary or unavoidable for the dog to be so isolated.

Explanation:

13.4 As explained above, the Council believes that all dogs should be protected by the requirements of welfare regulations, not just those bred by establishments require licensing.

The key controls provided by the Sale of Dogs provisions in the Breeding and Sale of Dogs (Welfare) Act 1999 should therefore be replaced by regulations which extend the protection to all puppies.

13.5 It is recommended that the offence of selling or gifting a dog less than eight weeks of age should apply whatever the destination of the dog. There is good evidence that the early removal of puppies from their dam is detrimental to their long term welfare. Moreover, the existing provision is illogical in welfare terms, as there is no evidence that the needs of an under-age puppy will be better met in a pet shop than in a family. Indeed, it could be argued that the pet-shop environment, while subject to inspection and potentially good in terms of physical environment, is very poor at meeting the need for a puppy to develop and exhibit normal behaviour patterns and the need to be housed with other animals.

13.6 Concerns have been raised about the potential impact of the eight week minimum before change of ownership on custom and practice by those training Assistance Dogs. The Council feels, however, that this concern is based on a misconception. It notes that not only do groups such as the Guide Dogs for the Blind Association have very particular reasons for wishing to begin the habituation and training of potential assistance dogs at the early age of six weeks, but they also have very stringent controls in place which ensure the welfare of the puppies and, as no change in ownership is involved, they would not be affected by this provision.

13.7 The final recommendation above is intended to address the specific problem which the Council has observed in pet shops offering puppies for sale – ie the housing in isolation of very young puppies because their litter mates have already been sold and the pet shop is unwilling to undertake the cost of vaccination which would enable litters to be mixed. The Council has been advised that the current Model Conditions for a pet shop licence are also unhelpful on this point and require urgent amendment or replacement.

13.8 The reference to licensed pet shops is retained because the 1951 Pet Animals Act, which creates the requirement for a pet shop to be licensed, relates to a broad range of pet animals. The Council's remit is limited to dogs and therefore it is not able to make recommendations relating to other species. It notes, however, that the fifty two year old Act is well overdue for substantial review and revision, not least to take account of the advent of Internet sales, and advances in the understanding of behavioural development in the dog, and its replacement by appropriate regulations under the Welfare Acts would facilitate the repeal of yet another outdated piece of primary legislation.

Recommendation 14

14.1 The Council is strongly of the view that a pet shop does not provide an appropriate environment for the homing, even on a temporary basis, of puppies. Even less does a dealer, operating under these regulations, but not from premises in any way recognisable as a pet shop, offer anything like an appropriate environment. Ideally it would like the practice of the sale of puppies from pet shops (and dealers) to cease, either through a voluntary ethical decision made by pet shop proprietors or through legislation. However, recognising that such an outcome is almost certainly some way off, the Council would recommend that a further Code of Practice should be developed with some urgency to cover the sale of dogs from pet shops. The Council would be willing to accord this work priority.