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# Breeding for quality of life

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## Abstract

*Many breeds of companion animal have inherited disorders that may impair quality of life (QoL) to the extent that it is unkind to keep them alive. If we struggle to discern when this point is reached, why do we breed compromised, short-lived animals in the first place? If we struggle to judge when environmental conditions cause an unacceptable QoL, why not breed appropriately for modern environments? In breeding pedigree dogs, five major problems arise: (1) some breed standards and selection practices run counter to dog welfare; (2) insufficient selection pressure seems to be exerted on some traits that would improve animal well-being and produce dogs better suited to modern environments; (3) the incidence of certain inherited defects in some breeds is unacceptably high; (4) the dearth of registered animals of certain breeds in particular countries makes it extremely difficult for breeders to avoid mating close relatives; and (5) there may be financial disincentives for veterinarians to reduce the incidence of inherited diseases. Before we can judge when behavioural or morphological changes caused by selective breeding result in an unacceptable QoL, we have to know which are prevalent. This paper reviews progress in two Australian schemes to monitor trends in the prevalence of inherited disorders in dogs and to promote behavioural phenotypes likely to cope with contemporary domestic environments.*

**Keywords**: *animal welfare, breeding, dog, epidemiology, inherited disorder, temperament*

## Introduction

Almost every animal that has ever lived has carried at least one deleterious recessive gene, and the average number of deleterious recessive genes carried by an individual dog can be as high as 20 (McGreevy & Nicholas 1999). Therefore, even without pressure from breed standards, many breeders would still find themselves producing dogs with serious defects as an unfortunate consequence of so-called 'closed studbooks'. In a closed studbook, the parents must be registered with the breed club or appear in another register of the breed accepted by the breed club (such as that in another country). This ensures that the animal is a pure-bred member of the breed. All animals registered as members of a particular breed with a closed studbook are descended from the foundation stock: animals accepted by the breed club prior to closing its studbook. All of this affects quality of life (QoL) for both dogs and their owners since pain, discomfort and distress can outweigh joy, happiness and pleasure. In addition, it affects life expectancy in affected dogs, with some breeds having a mean life expectancy as low as 4.9 years (Michell 1999).

Dogs as a species show unique morphological diversity among breeds that makes them of particular interest as a model for genomic investigations (Ostrander & Wayne 2005). Inherited disorders in dogs provide excellent models for a wide range of human inherited diseases, especially oncological, endocrine, musculoskeletal and neurological disorders, and as such are of significance for human health.

While acknowledging the major contribution made by dog breeders and dog-breeding organisations in fulfilling the important need of humans for animal companions, breeders and scientists have long been aware that all is not well in the world of companion-animal breeding. Welfare concerns associated with modern dog breeding have been discussed in the veterinary literature (eg Wegner 1979, 1995; Peyer & Steiger 1998; McGreevy & Nicholas 1999) and the popular press (eg Lemonick & Smith 1995). Attempts to reduce the prevalence of inherited disorders demand a multidisciplinary approach (Nicholas & Thomson 2004), but the strategic use of resources can be underpinned only by epidemiological studies.

Most (if not all) of the traits subjected to selection in the early days of canine domestication had direct utility and functionality. Many of the traits for which there was initially a functional basis were incorporated into the breed standards when dogs left the working arena and entered the world of dog shows (Coppinger & Coppinger 2001). Now it seems that some show standards place more importance on appearance than on functionality (McGreevy & Nicholas 1999). Breeders compete to see how well they can produce phenotypes that conform to a written standard that may include traits that have, at best, questionable welfare benefits.

In addition, many inherited disorders cannot be blamed on any breed standard. Because of natural selection, deleterious genes tend to occur at a low frequency, so the incidence of any particular defect is usually too low to cause major



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concern. However, the mating of relatives (inbreeding) changes this dramatically. Inbreeding does not, on average, change the frequency of deleterious genes, but it does significantly change the frequency of genotypes. In particular, it increases the frequency of homozygotes, thus permitting the expression of those deleterious recessive genes.

Generally, the more popular breeds show less homozygosity. That said, even in those breeds with very large numbers of registered animals, the tendency to breed from a small number of families (so-called 'line-breeding') means that the true rate of inbreeding is often much higher than that suggested by the registered pool of dogs. As a result, most breeds have their characteristic list of inherited defects, as documented by Patterson (1974, 1977), Clark and Stainer (1983), and Kirk (1986).

Each canine inherited disorder brings with it different welfare concerns. Even those that are not life-threatening are still significant, ranging from orthopaedic problems (eg hip dysplasia in many of the large and giant breeds) that expose dogs to arthritic pain and possibly the distress of corrective surgery, to compromised airways in brachiocephalics (ie dogs with short skulls, eg French bulldogs) that may create frustration by reducing their ability to play. Many dogs are euthanased on humane grounds because their defects are deemed to compromise their QoL so profoundly.

It has been argued (McGreevy & Nicolas 1999) that pedigree dog breeding faces five major problems:

(1) Some breed standards and selection practices run counter to dog welfare.

(2) Insufficient selection pressure seems to be exerted on some traits that would improve animal well-being and produce dogs better suited to modern environments.

(3) The incidence of certain inherited defects in some breeds is unacceptably high.

(4) The dearth of registered animals of certain breeds in particular countries makes it extremely difficult for breeders to avoid mating close relatives.

(5) There may be financial disincentives for veterinarians to reduce the incidence of inherited diseases because they are paid to diagnose and treat them.

In evolutionary terms, the environmental niche that companion dogs fill is unprecedented. Just as their early ancestors had to be functional and appropriately behaved for successful domestication, so, too, should modern dogs be selected for appropriate health and behaviour above all other traits. In a world that is beginning to appreciate the importance of biological diversity, it is appropriate that animals bred to share our homes are as diverse as their owners and their owners' lifestyles.

In the show ring, dogs in their youth and middle age are judged almost exclusively on their morphological qualities. It seems short-sighted to allow this sole emphasis to persist. Why not select breeding stock for traits that suit modern environments and that can adapt to changes, especially in social contexts? If unwelcome behaviour is among the chief causes of euthanasia and surrendering of pets (Overall 1997), why are we not doing more to select dogs with temperaments that suit companion animal homes, rather than just the show ring? This is critical since, in essence, the only temperament test show dogs have to pass is not biting the judge.

## Monitoring the prevalence of inherited disorders in dogs

We can reduce the costs, both in monetary and welfare terms, of inherited diseases, but first, we must know which disorders are prevalent in any country's most numerous breeds. Only then can we begin the task of effectively reducing their prevalence and monitoring our progress in doing so. This approach has led me to the creation of a sustainable system for collecting online data on inherited disorders in Australian dogs. It has brought together a consortium of key dog breeders, veterinarians, veterinary practice management, software providers and pet insurers, comprising Dogs NSW (formerly the Royal New South Wales Canine Council); RxWorks (a leading developer and global supplier of innovative software solutions and workflow management systems to service and support the veterinary industry); and PetSure (Australia's primary provider of pet health insurance products). This consortium has agreed to promote the online collection of diagnoses by practising veterinarians and the collation and dissemination of resultant data.

The central aim of this project is to collect and process data that will allow stakeholders, including breeders and veterinarians, to monitor the prevalence of inherited disorders. This will be achieved by:

• developing software that monitors certain fields in veterinary practice management databases currently in use in Australian practices;

• collating these data centrally to identify the most numerous disorders per breed and the age at which they most commonly present to veterinarians;

• disseminating data and summary information at no charge to key stakeholders, including veterinarians, breeders and potential puppy purchasers.

The continued collection of data will permit the first publication of trends in the prevalence of disorders within each breed and will thereby illustrate the need for control programs aimed at the most prevalent. If a high incidence of certain disorders correlates with specific elements within current breed standards, this may reflect the need to refine the standards. The trends will also highlight the need for some breeds to open their studbooks to permit the introduction of genes from other breeds. The project will provide a solid basis for breeders to prioritise disorders to be subjected to control programs, and make informed approaches to custodians of breed standards. Knowing which disorders are the most prevalent for each breed will inform all subsequent strategies intended to improve the welfare of the Australian pure-bred dog population. Data from the current project will allow the breeding targets for each generation of pure-bred dogs to be focussed on QoL. Although gathering diagnoses from non-specialist practitioners may be seen as crude and



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may allow some errors in reporting, it will provide overarching prevalence data that will work in parallel with existing disease eradication schemes and provide a watching brief on their progress.

This project builds on the success of the Listing of Inherited Disorders in Animals (LIDA, http://www.vetsci.usyd.edu.au/lida/), which is an online relational database launched in 2004 (McGreevy *et al* 2005). Receiving more than 25 000 hits per month, LIDA has a search facility that allows users to select from the 180 recognised dog breeds in Australia and find out which are prone to the more than 500 inherited disorders on the global record. It is linked to Online Mendelian Inheritance in Animals (OMIA, http://www.angis.org.au/Databases/BIRX/omia), an online database of genes, inherited disorders and traits in more than 135 animal species, which provides up-to-date lists of references for each disorder, together with direct access to genetic and comparative information for each disorder (Lenffer *et al* 2006). The proposed project is to expand the existing framework of LIDA to report on trends in the prevalence of diagnoses of inherited disorders in dogs. These reports are seamlessly updated from data on the caseloads of veterinarians in practice. Encouragingly, more than 250 Australian small animal veterinary practices have agreed in writing to contribute to this national audit on an ongoing basis.

By identifying for the first time the disorders that are most prevalent in any given breed, potential puppy purchasers can use these data to make informed decisions to avoid certain breeds, or to demand pups of their preferred breed that come from demonstrably unaffected parents (or which, in the fullness of time, have favourable estimated breeding values for the disorder). Either of these strategies may bring market forces into play and essentially encourage consumers to demand healthier dogs.

The most innovative feature of the current project is the way it allows practitioners to report data to the central data-collection system with an absolute minimum of effort and expense. By avoiding fatigue on the part of reporting practitioners and the need for ongoing incentives, this aspect of The University of Sydney's approach increases the sustainability of the project. Online epidemiology, using software patches integrated into existing practice management programs, can maintain the goodwill of reporting practices and ensure that resources are not wasted on paperwork, postage and manual data entry.

The sustainable characteristics of our proposed data-collection system (which maintain goodwill and reduce ongoing costs) mean that as the project matures, it will result in long-term perspectives. It will produce valuable age-at-diagnosis data that will enable vets to predict what tests will be required in pedigree dogs of a given age, in anticipation of the emergence of age-related disorders. The scheme provides a model that overseas dog-breeding and veterinary associations may wish to adopt but, in addition, the University of Sydney expects to be able to provide software that will facilitate collection of similar data overseas and may host a global repository of the resulting data.

## Breeding for temperament

Another initiative from the University of Sydney has identified a way to encourage selection of breeding dogs based partly on temperament (McGreevy 2005). The central idea is an award for show dogs that have passed a standardised temperament test. It has received strong support from the Australian Small Animal Veterinary Association (ASAVA) and Delta Society, and in-principle support from the Australian Veterinary Association (AVA), Australian Companion Animal Council (ACAC) and Australian National Kennel Council (ANKC).

Although the scheme has yet to be formally launched, its creators and the stakeholders above have identified the test that they will promote for this purpose: the Delta Society's Canine Good Citizen™ (CGC™) test. Although, like most tests of canine temperament, it is not validated, the CGC™ test was selected for this purpose because of its high profile and prevalence in Australia and its approval by the Australian Veterinary Association. Apart from basic tests of obedience, such as sit, lie down, and walk on a loose lead, the CGC™ test embodies a number of challenges, including accepting a stranger, walking through a crowd and being left alone out of sight of the owner for 5 min. Critically, it also includes an assessment of the dog's reaction to another dog and various other distractions. These are designed to demonstrate that the dog is confident at all times. A selection of challenges is drawn from a pool of seven types of distraction: a person on crutches, in a wheelchair, or using a walker; a sudden closing or opening of a door; dropping of a large book; a jogger; good-natured pushing and shoving or animated excited talk and back-slapping by persons; a person with a shopping cart; or a person on a bicycle.

The award will be presented at major shows in each capital city. Owners of dogs that have passed the CGC™ test will be encouraged to nominate their dogs for this award when registering to compete in a breed show. Within each group in the breed show (eg toys, gundogs, terriers and so on), the highest-placed dog that has already passed the CGC™ test will win the Australian Small Animal Veterinary Association Temperament Award. It is acknowledged that breeders could train a dog with an unreliable temperament to squeeze past the test. However, if for no other reason than time-saving during preparation for CGC™ testing, it is expected that breeders will be encouraged to select for 'easy to train' temperaments. This, after all, is what our companion dogs need to have.

Admittedly, the CGC™ test may favour breeds that are not typically 'wary' or 'aloof' (undefined adjectives that appear in the American Kennel Club breed standards for 11 and 2 breeds, respectively) (American Kennel Club 2007). As legacies of the breeds' original users, these traits still appear in several breed standards but seem to be of less relevance to modern puppy purchasers. The promotion of award-winning dogs and their progeny is likely to increase the demand for pure-bred dogs of desirable temperament. The veterinary profession can use these awards to demonstrate leadership in the behavioural health of the dogs of the future.



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## Conclusions

These two Australian projects are unique in that they unite producers (breeders) and health professionals (veterinarians) by providing a better outcome for consumers (puppy purchasers) and the subjects themselves (the dogs of the future).

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