

Oral presentation

Animal welfare in modern dog breeding

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Introduction

During the last few years a growing number of European kennel clubs have made an increasing number of rules and regulations for dog breeding, mainly concerning hip dysplasia (HD), elbow dysplasia (ED) and diagnoses based on DNA tests. However, despite the good intentions for improving health through strict regulations, the results can often be harmful to many breeds. Too heavy restrictions promote too heavy selection, thereby leading to matador breeding, inbreeding and decreased gene pools, and may result in an increased number of unregistered dogs with no health policy at all. Strict rules against certain diseases may also lead to an increase in other serious diseases which can not be detected through screening tests or DNA tests, consequently not being subject for eradication programs.

The Norwegian Kennel Club (NKC) has chosen another way to promote healthy dog breeding: recommendations, education and cooperation with the breeders and breed clubs. It is our true belief that this is far more beneficial to the dogs' health and welfare than heavy restrictions. The goal in modern dog breeding is that all dogs shall be functionally healthy, with a construction and a mentality typical to the breed, and will live a long, healthy and happy life. In other words, the goal is less work for veterinarians in treating inherited diseases or diseases due to the improper management and raising of dogs. This should be a common goal for all breeders, regardless of breed or nationality.

Revision of breed standards

The breed's typical features are described in the international breed standards. Healthy breed standards are essential for healthy dog breeding. At present 339 breeds are recognized by the FCI (Federation Cynologique Internationale). Each of them is the "property" of a specific country, the homeland of the breed, which is responsible for the breed standard, in cooperation with the Standard Commission and the Scientific Commission of the FCI [1]. During the last couple of decades, breed standards have been revised to promote functionally healthy dogs. The European Convention for Protection of Pet Animals, that was concluded in Strasbourg in 1987 and registered by the Secretary General of the Council of Europe in 1994, has been instrumental in the progress of this work. In addition to altering specific breed standards towards the description of a healthier and more functional anatomy, the following statement has been included since 2003 in every FCI breed standard: "Any dog clearly showing physical or behavioural abnormalities shall be disqualified". The term "disqualified" implies that the dog is atypical for the breed, and will be disqualified in the show ring.

However, although the breed standards have been through considerable changes in order to promote functional health, there are still specimens of some breeds with unfavourable anatomy. Some of these are the so-called "over-typed" dogs with too short a nose, excessively protruding eyes, too straight angulations etc. A breed standard can, at least in theory, be changed over-night, but it will take several generations to change the breed

through genetic selection in order to eradicate the unhealthy over-typed dogs.

There is no doubt that show judges have a large influence on the selection of dogs that will be used for breeding, and therefore on the health and welfare of purebred dogs. A judge may easily contribute to making a breed a nuisance by promoting "over-typing", which may consequently lead to health damage. Education and consciousness of the judges to recognise their responsibility concerning health issues, will have a considerable impact on the value of breeding programs, as the breed standard and the judges' interpretation of the standard will always be a major guideline in the breeding of purebred dogs.

Additionally, the veterinarians have a considerable responsibility in promoting selection of healthy dogs for breeding. Veterinarians should be cooperating with the Kennel Clubs in the education of judges; they should teach functional anatomy and make the judges understand the health consequences of an unhealthy anatomy.

The veterinarians must also be aware of their responsibility in advising the breeders to select functionally healthy dogs for breeding. It is an impossible demand that all veterinarians should be familiar with every breed standard. But there is one sentence in every breed standard that all veterinarians should know: "Any dog clearly showing physical or behavioural abnormalities shall be disqualified". Hence, if you have a French bulldog with breathing problems in your clinic, don't blame it on the breed standard in telling the owner that this is a normal French bulldog. The breed standard says: "The inclination of the nostrils as well as the snub nose (i.e. upturned) must allow a normal nasal breathing" [2]. Or, if you have bloodhound with ectropion on the lower eyelid and entropion of the upper eyelid, this is no longer a typical bloodhound. While the old standard described the eyes of the bloodhound to be rather small and deep-set in the head and with loose lower eyelids that reveal a dark red haw [3], the new FCI standard (2001) says: "Eyes of moderate size, oval, not weeping, neither protruding nor sunken into the socket, leaving the iris totally visible. Lids with no irregularity in their contour, normally fitting around the eye-ball; lower lids a little slack so that a little haw is visible are nevertheless tolerated. At no time should the eye-lashes touch or interfere with the eyes" [4]. So what was described as an excellent bloodhound some years ago, is now actually a bad specimen of the breed.

Screening programs

A screening program for a disease implies a recommendation to examine a lot of dogs of the breed in question for a specific disease, independent of clinical signs. Results of the screening are used in breeding programs. In order to

be efficient, the screening program should fulfil certain basic demands:

- The disease has a major impact on the dog's functional health
- The disease has a relatively high heritability
- There must be accurately described procedures and methods on how to perform the test required for establishing a diagnosis, as well as for the interpretation of the results

In Norway there are screening programs with results recorded in the database of the NKC on hip dysplasia (HD), elbow dysplasia (ED), hereditary eye diseases and results of some DNA-tests. In addition, NKC has a screening program for spondylosis deformans and stifle arthrosis in the Boxer. It is of course a basic demand that every dog before screening must be identified with tattoo or microchip. All members of NKC as well as the veterinarians have free access to the results in the database. NKC will not register puppies from parents with severe HD or ED, irrespective of the breed.

A screening program can be helpful in healthy dog breeding if it is used in the correct way. One major problem with breeding programs based on screening results, is that there is placed too much focus on one or a few selected diseases and too little on other problems that may have a more harmful impact on the dogs' health and welfare. Statistics from one of the largest Norwegian companies for dog insurance (Gjensidige NOR) showed that problems in the stifle joint is the most common skeletal disease in dogs, and that skin problems are more common than all skeletal diseases together [5]. It may be possible to create effective screening programs for most of the stifle problems, but it will be impossible to initiate efficient screening programs for the majority of skin diseases.

National disease register

Do we actually need additional screening programs? Most of these programs are expensive for the dog owner, and if expected to adhere to a lot of screening requirements, it may result in poor owner compliance, fewer diagnoses and thereby less reliable statistics. What we really need is a national disease register based on veterinary diagnoses that are linked to the identification of the dog. This register could be used to:

- Survey the general health condition in the dog population, including infectious diseases
- Survey the occurrence of inherited diseases in individual breeds

- Collect and supply information on individual dogs to be used in the breeding programs

To attain full advantage of the register, selected individual data should become available to the breeders. This is difficult due to the demand of veterinary professional secrecy; thus, the owner's permission for the veterinarian to report to the register would be necessary. However, if the result of an owner's cooperation is that the dog in question as well as its relatives is banned from breeding, future cooperation with the breeder may become impossible. Nobody wants to be punished for being honest.

However, if the aim of the register is to obtain information without necessarily excluding dogs from breeding, the diagnoses in the register could still be of great help in the breeding of healthy dogs. The basic recommendation should be that *only functionally healthy dogs should be used for breeding*. It is my true belief that no conscientious breeder really wants to breed diseased dogs. Based on this register, the breeders would have a valuable tool in selecting dogs for breeding. They would have a great opportunity to avoid combining dogs from families with prevalence of the same disease, thereby reducing the risk of diseased offspring. If the breeders were allowed to use the register in this way, most of them would be happy to cooperate with the register and encourage owners of dogs from their kennel to allow the veterinarians to report to the register.

Rules and regulations – national health committees

Each kennel club should have its own health committee, advising breed clubs on health issues. NKC has very few registration restrictions compared to most other kennel clubs, and gives the breed clubs considerable responsibility for detailed *advice* in the breeding programs. We put a lot of effort in educating the breed clubs and the breeders. It is our belief that it is better to encourage and include as many breeders as possible to be organized in the kennel club and to educate them on how to breed healthy dogs, instead of excluding too many dogs and too many breeders due to heavy restrictions. We can only influence the breeders that cooperate with the kennel club. In Norway a large majority of purebred dogs are registered in the kennel club, in most breeds close to 100%.

A total of 66 breeds must have an official HD status if their puppies are to be registered in NKC, based on recommendation from the breed clubs. The breed clubs, however, will also encourage the rest of the breed to have an official HD status. The result is that a large number of dogs have an official HD status. An average of 35% of all dogs from 70 breeds born in 1980–1990 have an official HD status, and 46% of the dogs of these breeds born in 1991–2003 have an official HD status (Figure 1). In some breeds more than 70% of the breed has official status. To our knowledge these numbers are higher than in any other kennel club.

Norway was one of the first countries to start screening for elbow dysplasia (ED) in vulnerable breeds. It started back in the early eighties with the Rottweiler and a few years

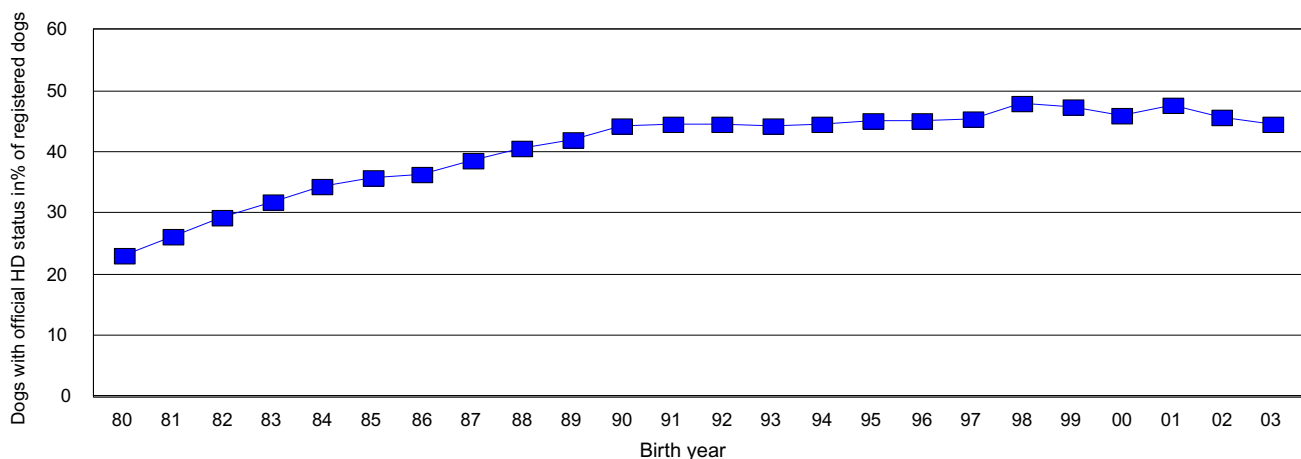


Figure 1

The prevalence of dogs with official hip dysplasia (HD) status in 70 breeds, born from 1980–2003 ($n = 164000$) in percentage of number of dogs of these breeds registered in Norwegian Kennel Club (NKC) in the same period ($n = 403991$). The number of registered dogs of these breeds represents 69% of all dogs registered in the NKC during these years, and 93% of all dogs with official HD status. (Based on data from NKC, <http://www.nkk.no>).

later for the Bernese mountain dog. Later other breeds have followed. Due to the fact that screening for ED was rather uncommon in most countries, NKC refused to have a rule saying that all breeding animals of certain breeds had to have an official ED status. The consequence of such a rule would probably have drastically narrowed the genetic diversity of the breeds, due to the fact that very few foreign dogs had an official ED status. Presently, ED status is available for breeding dogs in a growing number of breeds in a growing number of countries. So, in 2005, NKC made it possible for the breed clubs to apply for compulsory known status also for ED for breeding animals. Only one club did apply. The other breeds that have an ED problem have already been screening for ED for many years, and close to 100% of all breeding dogs have official status. In Rottweilers, 47.7% (n = 6468) of all dogs born 1981–2005 (n = 13566) have an official ED status, in Bernese mountain dogs 67.9% (n = 3949) of dogs born 1986–2005 (n = 5818) and 73.5% (n = 2493) of dogs born 1994–2005 (n = 3393) have official ED status. This great participation in screening programs is not due to rules and restrictions, but to information and education of the breeders and cooperation between the breed club and the NKC. Cooperation and education can often give far superior results than rules and restriction. The one club that did apply for compulsory known ED status for breeding dogs was the breed club for St. Bernhards. They did not succeed in voluntary screening, and it was necessary to make a rule for the breeding animals.

Breeding values

A realistic goal concerning HD and ED is not to eradicate the diseases, but to lower the prevalence of the disease in the population. But despite excellent participation in the

screening programs and the fact that a large majority of the breeding dogs are free of HD, the data from NKC shows depressingly low improvement of the radiographic prevalence in most breeds. Figure 2 shows the results in the German shepherd dog, the most popular breed in Norway. This is probably mainly due to the fact that the screening result only tells us about the dogs' phenotype, which is not equal to the dogs' genotype. Studies of various populations and breeds show heritability estimates ranging from 0.1–0.6 for HD [6-12], and 0.1–0.4 for ED [11,13-16]. Maybe there is in fact a genetic progress in most breeds due to the breeding programs, but the progress is hidden in the statistics by a worsening of the environmental factors that influence the development of the diseases?

Selection and combination of dogs based on breeding values, will hopefully be a valuable supplement in the future breeding programs on polygenetic diseases, as a breeding value is based not only on the screening result of the dog and it's offspring, but also on a large number of ancestors and relatives. But to be efficient, results from a lot of dogs in the breed must be available.

The goal in screening programs is *reliable* statistics that can be used for estimating breeding values, not "nice" statistics that include only the best results. The statistics must tell the truth about the population; every dog that is x-rayed for HD and ED must have an official result. In order to be allowed to send x-rays for official diagnosis in the NKC, the veterinarian must sign a written agreement with NKC, developed in cooperation with the Norwegian Veterinary Association. This agreement states that the veterinarian will x-ray for screening for HD and ED only if the

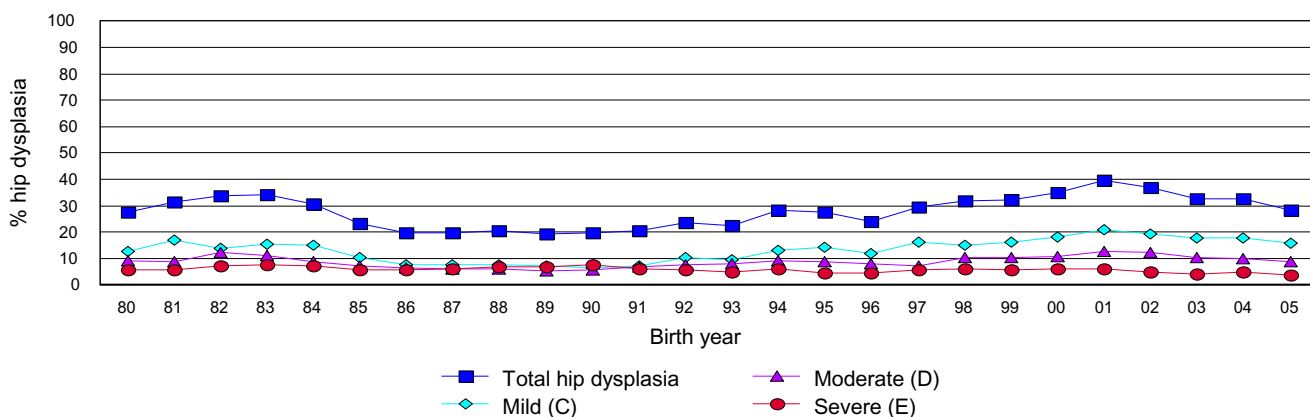


Figure 2

The prevalence of hip dysplasia in German shepherd dogs in Norway from 1980–2005, based on radiographic screening of the coxofemoral joint. The total number of registered dogs of the breed in this period is 62842, of which 29460 were examined (47.0%). A large majority of dogs used for breeding had normal hips; very rarely dogs with mild degree (C) were used. (Based on data from the NKC, <http://www.nkk.no>).

owner, prior to the examination of the dog, has signed a form that allows NKC to make the result of examination public in their database. If a dog younger than the minimum age (12 months; 18 months for 10 large breeds) is examined due to clinical symptoms of HD or ED, the veterinarian will ask the owners' permission to send the radiographs for a screening diagnosis in NKC. If the result is moderate or severe HD or ED, the result will be made public in the NKC database as the dogs' official result. This might of course worsen the present HD or ED statistics of the breed, but will hopefully improve the genetic health in future generations by resulting in more reliable breeding values. In index-based breeding, based on breeding values, the specific combination of dogs used for breeding will be more important than the status of the dog itself. If the mean breeding value of the combination is better than the average of the breed, the result should be a reduction in the prevalence of the disease.

DNA tests

The results of DNA tests can contribute to healthy dog breeding as part of a breeding program. The test will tell us whether a dog is free of the gene causing a recessive disease, if it is a carrier or if it will develop the disease. Through selective breeding where at least one parent of the litter is free of the gene, we can be certain that the puppies will not develop that particular disease; there is no need to exclude the carriers from breeding as long as they are functionally healthy dogs.

Studies of major genes affecting polygenetic diseases will probably have a great impact on future dog breeding. Recent studies of HD and ED have reported a strong indication for major genes affecting HD and ED, suggesting that considerable genetic progress may be possible by selection against the major gene [17].

Mental health

The importance of breeding mentally healthy dogs must never be forgotten in breeding and raising dogs. The environment in which puppies are raised during their first weeks and months of age is of the uttermost importance for the rest of their lives. Their genetic makeup is the basis for normal breed specific behaviour. But the environmental exposure, to be handled and stimulated by their mother, breeder and others to develop social sense and response is imperative in raising functionally mentally healthy dogs. The behaviourists, veterinarians, experienced breeders and kennel clubs must cooperate in the education of breeders and dog owners to prevent mental problems caused by the raising and management of dogs.

Breeding programs

A breeding program should be a guideline for breeders. Some ethical aspects should be the same for every breed,

in addition to important breed specific health issues. The program should consist of both basic demands that must be fulfilled in order to register puppies, and recommendations on how to breed, how to select dogs for breeding and how to make the right combinations. Eradication of genetic diseases and breeding only genetically healthy dogs is a totally unrealistic goal. Too strict regulations and demands in breeding programs could have the opposite effect, as it will exclude too many dogs, reducing the breeding population and resulting in inbreeding. And if we, theoretically, were able to breed genetically healthy dogs, could we then be sure that these dogs were also functionally healthy? Probably not: breeding is more than mating; dogs are a lot more than the combination of genes. To succeed in breeding healthy dogs, some simple basic rules and recommendations should be followed [18]:

Basic rules and recommendations for breeding healthy dogs

1. Only functionally, clinically healthy dogs should be used for breeding; dogs with chronic diseases should never be bred unless we know for sure that heritability plays no role in causing the disease. If a dog suffers clinically from a disease that is suspected, but not proven, to be inherited, the dog should not be bred. If close relatives of such a dog are used for breeding, they should be mated to dogs from bloodlines with low or no occurrence of the same disease.
2. The breeding program should not exclude more than 50% of the breed; the breeding stock should be selected from the best half of the population.
3. Avoid matador breeding. A basic *recommendation* should be that no dog should have more offspring than equivalent to 5% of the number of puppies registered in the breed population during a five-year period.
4. A bitch that is unable to give birth normally, due to anatomy or inherited inertia, should be excluded from further breeding – irrespective of the breed.
5. A bitch that is unable to take care of the newborn puppies, due to its mentality or inherited agalactia, should be excluded from further breeding.
6. Dogs with a mentality atypical for the breed, and aggressive dogs, should be excluded from breeding.
7. Screening results for polygenetic diseases should be used for preparation of an individual breeding value, based on both national and international screening results. The average breeding value for the combination should be better than the average for the breed. Screening should only be recommended for diseases and breeds

where the disease has a major impact on the dogs' functional health.

8. Results from DNA tests should be used to avoid breeding diseased dogs, not necessarily to eradicate the disease.

9. Breed specific health issues that cannot be diagnosed by DNA-tests or screening programs must still be included in a breeding program.

10. The raising of puppies, with correct feeding, environmental exposure, stimulation by their mother, breeder and others to develop social sense and response, must be basic in all breeding.

If these simple basic recommendations were implied in a breeding program, we would attain a considerable improvement in the dogs' functional health.

Summary

Knowledge, education, honesty and cooperation are keys in succeeding in breeding healthy dogs. Breeding regulations and restrictions should be based on scientific and practical knowledge as well as common sense. Strict breeding regulations do not necessarily result in healthy dogs, but may in fact have the opposite effect. It is not enough to take only some details or screening results into consideration when selecting dogs for breeding; both the individual dog and the breed must be looked upon in its entirety. Too stringent demands in eradication programs may eradicate the best breeders and excellent breed representatives – instead of the disease!

Screening results and DNA-tests are valuable tools in healthy dog breeding if they are used correctly. DNA-tests should be used to avoid breeding diseased dogs, not necessarily to eradicate the gene causing the disease from the population. Screening results on polygenetic diseases should be used for preparing breeding values to benefit selection and combination of dogs for breeding. But in order to succeed, the screening results must tell the truth about the breed population. A national disease register based on veterinary diagnoses, which are linked to the identification of the diseased dog, would be a most valuable tool in modern dog breeding.

The conscientious breeders want to cooperate with scientists to the benefit of the dogs – and to the benefit of science. Don't eliminate these breeders by making impossible demands!

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