

Breed club requirements for breeding approval of dogs in relation to the prevention of genetically determined diseases

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Abstract

Selective breeding has contributed to the development of numerous dog breeds but has also increased the prevalence of inherited disorders, raising concerns regarding canine health and welfare. Mandatory health examinations required prior to breeding approval represent an important preventive tool; however, their scope and application vary among breeds. This study evaluated health examination requirements established by breed clubs affiliated with the Czech-Moravian Kennel Union, with emphasis on the number and type of mandatory examinations targeting inherited disorders. Publicly available documents from 139 breed clubs covering 325 dog breeds were analysed. Mandatory examinations were categorized according to affected body systems, and their distribution was assessed in relation to breed size and utilization. At least one mandatory examination was required in 50.2% of breeds. The most frequently required examinations targeted musculoskeletal disorders, particularly hip dysplasia, whereas examinations for hearing, urological, and cardiac conditions were least common. Significant differences were observed among examination categories. Breed size influenced requirements only for musculoskeletal and ocular examinations, while breed utilization was associated with differences exclusively in ocular disease screening. The results demonstrate substantial heterogeneity in preventive health requirements across breeds and highlight an emphasis on selected well-established conditions, with limited attention to other clinically relevant inherited disorders. Broader and more consistent implementation of mandatory examinations may contribute to improved health management and welfare in purebred populations.

Canine, health screening, hereditary disease, kennel club, welfare

The domestication and selective breeding of dogs have led to the development of hundreds of distinct breeds (Parker et al. 2017; Talenti et al. 2018). In the nineteenth century, formal breed standards were established, and intensive artificial selection was applied to achieve close conformity with these standards. Selective pressures, inbreeding, and the frequent use of popular individuals for reproduction to maintain specific phenotypic and behavioural traits have markedly reduced genetic diversity within individual breeds (Bunel et al. 2019). Reduced genetic diversity is commonly associated with inbreeding depression, a phenomenon whereby close breeding leads to decreased average fitness and compromised phenotypic traits within a population (Cecchi et al. 2016). Pedersen et al. (2013) compared genetic diversity among eight dog breeds, including breeds primarily selected for conformation (e.g. Poodle), breeds selected for both conformation and working ability (e.g. Brittany Spaniel), and breeds selected exclusively for work alone (e.g. Irish Red Setter). Using village dogs as a reference population with assumed maximal ancestral genetic diversity, they demonstrated that modern breeds, particularly those selected solely for show purposes, exhibit markedly reduced genetic diversity, while working breeds retained relatively higher levels of diversity.

Each breed was selectively bred according to specific standards, including coat colour, body shape, size, and growth, to fulfil particular roles such as herding, guarding,

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or hunting (Collins et al. 2011; Mabunda et al. 2022). However, breeding practices were often inadequately controlled, and insufficient attention was paid to their long-term genetic consequences. The intensive use of certain sires, frequently regarded as champions of a breed, resulted in the widespread propagation of undesirable alleles (Marsden et al. 2016; Bunel et al. 2019). Consequently, many purebred dogs today suffer from a high prevalence of genetically determined disorders (Wiles et al. 2017). Most of these diseases are breed-specific, and nearly all breeds are affected by at least one or more hereditary disorders (Bunel et al. 2019). Pfeiffer (2006) noted that dogs are affected by more hereditary diseases than any other species. Given these concerns, DNA registries and genetic testing of purebred dogs have become important tools for the prevention and investigation of genetically determined diseases (Nicholas et al. 2011; Mellersh 2013). Genetically determined diseases pose a serious threat to canine health and welfare. Their presence not only shortens the lifespan of affected individuals but also significantly compromises welfare, manifesting as physical suffering, reduced mobility, pain, and overall decreased quality of life (Collins et al. 2010, 2011; Fawcett et al. 2019; McLeay and Child 2026).

Breeding approval refers to the formal evaluation process conducted by breed clubs, which determines whether a dog is eligible for use in pedigree breeding and for the issuance of pedigrees to its offspring. Given the high prevalence of genetically determined diseases in purebred dogs and the impact of selective breeding on genetic diversity, it is essential to examine how breed clubs regulate this process. Mandatory health examinations represent a key measure to prevent the propagation of hereditary disorders and to safeguard canine health and welfare. Therefore, the aim of this study was to evaluate the requirements established by breed clubs affiliated with the Czech-Moravian Kennel Union for breeding approval of dogs, with particular emphasis on the number of mandatory examinations for genetically determined diseases, and to further assess these requirements according to breed utilization and breed size.

Materials and Methods

Data used for the analysis were obtained from the official website of the Czech-Moravian Kennel Union (<https://www.cmku.cz>) and from publicly available documents of individual breed clubs affiliated with the Czech-Moravian Kennel Union. In total, 139 breed clubs representing 325 dog breeds were evaluated (status as of 23 April 2024).

Data concerning the conditions for breeding approval of dogs were analysed with respect to mandatory examinations required by individual breed clubs. The mandatory examinations were subsequently classified into groups according to the body system affected or the category of disease. Accordingly, the examinations were divided into screening for neurological and neurodegenerative diseases, urological diseases, musculoskeletal disorders, diseases of vision and hearing, cardiac diseases, and other examinations, which included screenings for diseases not classified into any of the above-mentioned categories. The number of breeds for which each examination was mandatory was recorded. The obligation of the listed examinations was further evaluated according to breed size and breed utilization.

For the purposes of the study, breeds were divided according to size into small or large. A height at the withers of 50 cm was used as the threshold, consistent with the classification applied by the Fédération Cynologique Internationale (FCI). Breeds with a breed standard specifying a height at the withers exceeding 50 cm were classified as large breeds ($n = 190$), whereas breeds with a height at the withers of up to 50 cm were classified as small breeds ($n = 135$).

According to utilization, breeds were categorized based on the description of use in the FCI breed standard into companion ($n = 55$), working ($n = 196$), and combined ($n = 74$) breeds. Combined breeds included those whose breed standards state that, in addition to working use, they also serve as companions.

Statistical analysis was performed using Unistat for Excel (version 6.5). Differences between the frequencies of breeds mandatorily examined for the monitored disease groups, as well as differences in the frequencies of required examinations among breed categories according to size and utilization, were evaluated using the chi-square (χ^2) test within the framework of $k \times m$ and 2×2 contingency tables (with Yates' correction). For datasets with observed frequencies less than 5, Fisher's exact test was applied. A P value < 0.05 was considered significant.

Results

At least one mandatory examination prior to breeding approval was required for 163 breeds (50.2%), whereas no mandatory examination was required for 162 breeds (49.8%).

An overview of the required examinations and the number of breeds for which each examination was mandatory is presented in Tables 1–7. Significant ($P < 0.05$) differences were observed between examination categories in the number of breeds for which examinations were mandatory (Fig. 1). The most commonly required mandatory examinations were for musculoskeletal disorders, encompassing 186 breeds. Within this category, hip dysplasia was required in 155 breeds, elbow dysplasia in 45 breeds, and patellar luxation in 41 breeds. The least frequently required examinations were for hearing disorders (7 breeds), urological diseases (8 breeds), and cardiac diseases (8 breeds).

Table 1. Mandatory examinations for neurological and neurodegenerative diseases in dogs.

Disease / Examination	Total number of breeds	Number of breeds by size		Number of breeds by utilization		
		Small breeds n (%)	Large breeds n (%)	Working breeds n (%)	Companion breeds n (%)	Combined breeds n (%)
Degenerative myelopathy	12	1 (8.3%)	11 (91.7%)	8 (66.6%)	2 (16.7%)	2 (16.7%)
Leukoencephalomyelopathy	1	0 (0%)	1 (100%)	0 (0%)	0 (0%)	1 (100%)
Polyneuropathy	1	0 (0%)	1 (100%)	0 (0%)	0 (0%)	1 (100%)
Juvenile epilepsy	1	1 (100%)	0 (0%)	1 (100%)	0 (0%)	0 (0%)
Lagotto storage disease	1	1 (100%)	0 (0%)	1 (100%)	0 (0%)	0 (0%)
Neuroaxonal dystrophy	1	1 (100%)	0 (0%)	1 (100%)	0 (0%)	0 (0%)
Ataxia	1	1 (100%)	0 (0%)	0 (0%)	1 (100%)	0 (0%)
Neuronal ceroid lipofuscinosis type 8	1	1 (100%)	0 (0%)	1 (100%)	0 (0%)	0 (0%)
Hereditary necrotizing myelopathy	1	1 (100%)	0 (0%)	1 (100%)	0 (0%)	0 (0%)
Hereditary epilepsy	1	1 (100%)	0 (0%)	1 (100%)	0 (0%)	0 (0%)
Total*	19	7 (36.8%)	12 (63.2%)	13 (68.4%)	3 (15.8%)	3 (15.8%)

* Total number of breeds for which one or more examinations are mandatory (this value does not represent a sum, as a breed may be listed under more than one examination)

Table 2. Mandatory examinations for urological diseases in dogs.

Disease / Examination	Total number of breeds	Number of breeds by size		Number of breeds by utilization		
		Small breeds n (%)	Large breeds n (%)	Working breeds n (%)	Companion breeds n (%)	Combined breeds n (%)
Ultrasonographic examination of the kidneys	2	1 (50.0%)	1 (50.0%)	2 (100%)	0 (0%)	0 (0%)
Renal evaluation using UPC and SDMA	1	1 (100%)	0 (0%)	1 (100%)	0 (0%)	0 (0%)
Polycystic kidney disease	1	0 (0%)	1 (100%)	1 (100%)	0 (0%)	0 (0%)
Cystinuria	3	1 (33.0%)	2 (66.0%)	1 (33.0%)	1 (33.0%)	1 (33.0%)
Fanconi syndrome	1	1 (100%)	0 (0%)	0 (0%)	0 (0%)	1 (100%)
Hyperuricosuria	1	0 (0%)	1 (100%)	0 (0%)	0 (0%)	1 (100%)
Examination for ectopic ureter	1	0 (0%)	1 (100%)	0 (0%)	0 (0%)	1 (100%)
Total*	8	3 (37.5%)	5 (62.5%)	3 (37.5%)	1 (12.5%)	4 (50.0%)

* Total number of breeds for which one or more examinations are mandatory (this value does not represent a sum, as a breed may be listed under more than one examination)

Figure 2 shows the number of breeds with mandatory examinations by examination category and breed size. No significant ($P > 0.05$) differences were observed between small and large breeds for most examination categories, with the exceptions of musculoskeletal disorders, which were significantly ($P < 0.01$) more frequently required in large breeds, and ocular diseases, which were significantly ($P < 0.01$) more frequently required in small breeds.

Figure 3 shows the number of breeds with mandatory examinations by examination category and breed utilization. The only significant difference was observed for ocular diseases, which were significantly ($P < 0.05$) more frequently required in companion breeds compared to working breeds. The number of combined breeds with mandatory examinations for ocular diseases did not differ significantly ($P > 0.05$) from either companion or working breeds.

Table 3. Mandatory examinations for musculoskeletal disorders in dogs.

Disease / Examination	Total number of breeds	Number of breeds by size		Number of breeds by utilization		
		Small breeds n (%)	Large breeds n (%)	Working breeds n (%)	Companion breeds n (%)	Combined breeds n (%)
Patellar luxation	41	34 (82.9%)	7 (17.1%)	8 (19.5%)	22 (53.7%)	11 (26.8%)
Osteochondrosis	9	0 (0%)	9 (100%)	7 (77.8%)	0 (0%)	2 (22.2%)
Hip dysplasia	155	25 (16.1%)	130 (83.9%)	97 (62.6%)	13 (8.4%)	45 (29.0%)
Elbow dysplasia	45	5 (11.1%)	40 (88.9%)	25 (55.6%)	4 (8.9%)	16 (35.6%)
Osteogenesis imperfecta	1	1 (100%)	0 (0%)	1 (100%)	0 (0%)	0 (0%)
Polymyositis	1	1 (100%)	0 (0%)	1 (100%)	0 (0%)	0 (0%)
Spondylosis	2	0 (0%)	2 (100%)	1 (50.0%)	0 (0%)	1 (50.0%)
Van den Ende-Gupta syndrome	2	2 (100%)	0 (0%)	2 (100%)	0 (0%)	0 (0%)
Total*	186	54 (29.0%)	132 (71.0%)	102 (54.8%)	34 (18.3%)	50 (26.9%)

* Total number of breeds for which one or more examinations are mandatory (this value does not represent a sum, as a breed may be listed under more than one examination)

Table 4. Mandatory examinations for ocular diseases in dogs.

Disease / Examination	Total number of breeds	Number of breeds by size		Number of breeds by utilization		
		Small breeds n (%)	Large breeds n (%)	Working breeds n (%)	Companion breeds n (%)	Combined breeds n (%)
Examination for hereditary eye disorders	50	30 (60.0%)	20 (40.0%)	21 (42.0%)	14 (28.0%)	15 (30.0%)
Examination for progressive retinal atrophy	27	20 (74.1%)	7 (25.9%)	12 (44.4%)	10 (37.0%)	5 (18.6%)
Total*	50	30 (60.0%)	20 (40.0%)	21 (42.0%)	14 (28.0%)	15 (30.0%)

* Total number of breeds for which one or more examinations are mandatory (this value does not represent a sum, as a breed may be listed under more than one examination)

Table 5. Mandatory examinations for hearing disorders in dogs.

Disease / Examination	Total number of breeds	Number of breeds by size		Number of breeds by utilization		
		Small breeds n (%)	Large breeds n (%)	Working breeds n (%)	Companion breeds n (%)	Combined breeds n (%)
BAER test for the diagnosis	7	3 (42.9%)	4 (57.1%)	4 (57.1%)	0 (0%)	3 (42.9%)
Total	7	3 (42.9%)	4 (57.1%)	4 (57.1%)	0 (0%)	3 (42.9%)

Table 6. Mandatory examinations for cardiac diseases in dogs.

Disease / Examination	Total number of breeds	Number of breeds by size		Number of breeds by utilization		
		Small breeds	Large breeds	Working breeds	Companion breeds	Combined breeds
		n (%)	n (%)	n (%)	n (%)	n (%)
Clinical examination of the heart	5	3 (60.0%)	2 (40.0%)	2 (40.0%)	2 (40.0%)	1 (20.0%)
Genetic testing for dilated cardiomyopathy	3	1 (33.3%)	2 (66.6%)	2 (66.6%)	0 (0%)	1 (33.3%)
Total*	8	4 (50.0%)	4 (50.0%)	4 (50.0%)	2 (25.0%)	2 (25.0%)

* Total number of breeds for which one or more examinations are mandatory (this value does not represent a sum, as a breed may be listed under more than one examination)

Table 7. Other mandatory examinations in dogs.

Disease / Examination	Total number of breeds	Number of breeds by size		Number of breeds by utilization		
		Small breeds	Large breeds	Working breeds	Companion breeds	Combined breeds
		n (%)	n (%)	n (%)	n (%)	n (%)
Pyruvate dehydrogenase phosphatase 1 deficiency	2	2 (100%)	0 (0%)	2 (100%)	0 (0%)	0 (0%)
Exercise tolerance test	2	2 (100%)	0 (0%)	0 (0%)	2 (100%)	0 (0%)
Mycobacterium avium complex	1	1 (100%)	0 (0%)	0 (0%)	1 (100%)	0 (0%)
Trapped neutrophil syndrome	1	0 (0%)	1 (100%)	1 (100%)	0 (0%)	0 (0%)
Inflammatory lung disease of Collies	1	0 (0%)	1 (100%)	1 (100%)	0 (0%)	0 (0%)
Dwarfism	2	0 (0%)	2 (100%)	1 (50%)	1 (50%)	0 (0%)
Fucosidosis	1	0 (0%)	1 (100%)	1 (100%)	0 (0%)	0 (0%)
Thyroid gland examination	1	0 (0%)	1 (100%)	1 (100%)	0 (0%)	0 (0%)
Thrombopathy	1	0 (0%)	1 (100%)	0 (0%)	0 (0%)	1 (100%)
Von Willebrand disease	1	1 (100%)	0 (0%)	1 (100%)	0 (0%)	0 (0%)
Total*	13	6 (46.2%)	7 (53.8%)	8 (61.5%)	4 (30.8%)	1 (7.7%)

* Total number of breeds for which one or more examinations are mandatory (this value does not represent a sum, as a breed may be listed under more than one examination)

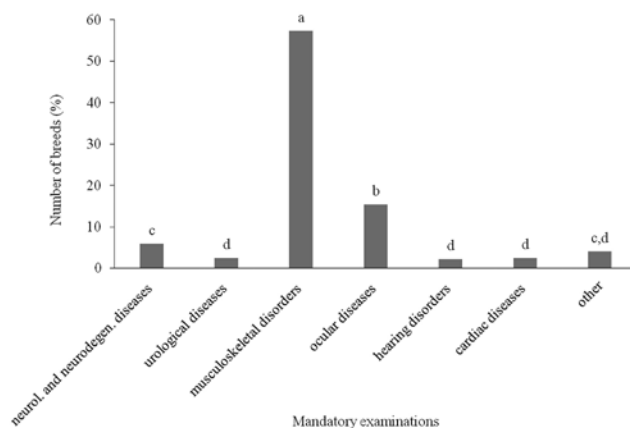


Fig. 1. Number of breeds (n = 325) with mandatory examinations by examination category

^{a-d}Different letters above the columns indicate significant differences in the number of breeds between examination categories ($P < 0.05$)

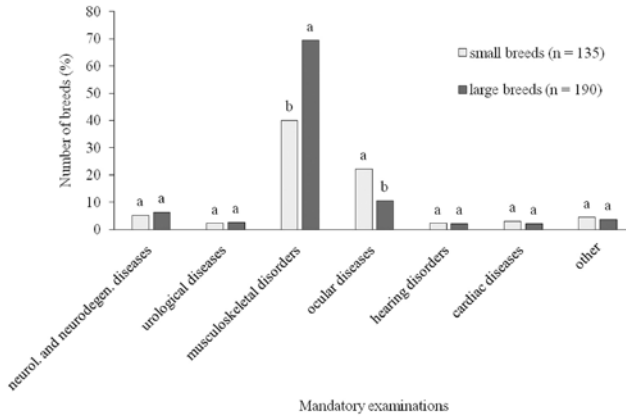


Fig. 2. Number of breeds with mandatory examinations by examination category and breed size

^{a,b} Different letters above the columns indicate significant differences in the number of breeds between small and large breeds within each examination category ($P < 0.01$)

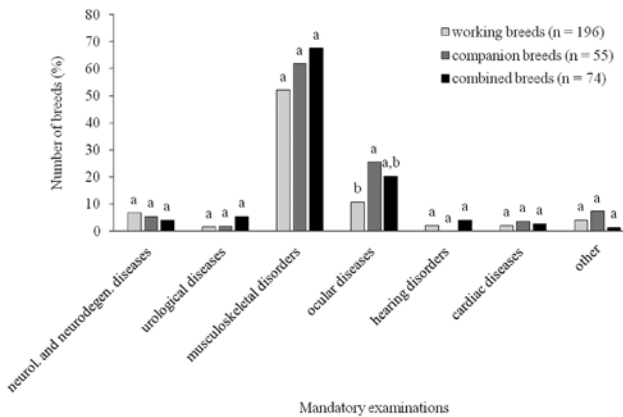


Fig. 3. Number of breeds with mandatory examinations by examination category and breed utilization

^{a,b} Different letters above the columns indicate significant differences in the number of breeds between working, companion, and combined breeds within each examination category ($P < 0.05$)

Discussion

This study provides a comprehensive overview of breeding approval requirements imposed by breed clubs affiliated with the Czech-Moravian Kennel Union, with a particular focus on mandatory examinations for genetically determined diseases. The results demonstrate considerable variability among breeds and examination categories, indicating that preventive health requirements are not uniformly applied across dog breeding. Approximately half of the evaluated breeds required at least one mandatory examination prior to breeding approval, while the remaining breeds did not require any examination. This heterogeneity highlights considerable differences in preventive strategies

among breed clubs. Given that nearly all dog breeds are affected by at least one hereditary disorder (Bunel et al. 2019), the absence of mandatory examinations in many breeds raises concerns that affected individuals or carriers may enter breeding programs undetected, allowing deleterious alleles to persist and spread within populations.

Musculoskeletal disorders represented by far the most frequently required category of mandatory examinations. This finding is consistent with the high prevalence and clinical significance of conditions such as hip dysplasia, elbow dysplasia, and patellar luxation, particularly in medium- and large-sized breeds (Burton and Owen 2008; Kalff et al. 2014; Herrera-Perez et al. 2020). Hip dysplasia was the single most commonly required examination, reflecting its long-recognized impact on canine health, welfare, and longevity (Wilson et al. 2011; Krontveit et al. 2012). Data from the Belgian National Committee for Inherited Skeletal Disorders showed that a substantial proportion of dogs were mildly to severely affected by at least one skeletal disorder (Coopman et al. 2014), underscoring the importance of systematic screening. The relatively high frequency of mandatory musculoskeletal examinations suggests that breed clubs generally acknowledge both the welfare implications of these conditions and the effectiveness of screening programs. Long-term selection based on phenotypic screening has been shown to reduce the prevalence of hip and elbow dysplasia in multiple breeds (Oberbauer et al. 2017). Similarly, in Sweden, extensive screening of breeding stock has been associated with a marked reduction in moderate to severe hip dysplasia in many breeds (Hedhammar 2020), providing a strong example of successful preventive breeding policy.

In contrast, mandatory examinations for hearing disorders, urological diseases, and cardiac diseases were required in only a small number of breeds. While this may partly reflect lower prevalence of some of these conditions across the general dog population, it may also indicate underestimation of their clinical relevance or limited integration of available diagnostic tools into breeding regulations. Congenital deafness, for example, is well documented in several breeds, and reliable diagnostic methods such as the BAER test are widely available (Mariscoli 2010; Plonek et al. 2016). Likewise, inherited cardiac diseases, including dilated cardiomyopathy, can have severe or fatal consequences (Moise 1999; Santilli et al. 2021; Filipejová et al. 2024), yet mandatory screening was required in only a limited number of breeds. These findings suggest potential gaps in preventive breeding strategies, particularly for disorders with late onset or subclinical early stages. Although mandatory health examinations represent an important preventive tool, effective management of inherited disease requires a multifaceted approach integrating screening schemes, pedigree analysis, and, where appropriate, genomic information to balance disease reduction with the preservation of genetic diversity (Farrell et al. 2015).

The prominence of musculoskeletal and ocular examinations observed in this study is consistent with breeder perceptions reported previously. A survey of Finnish dog breeders found that inherited skeletal and ocular diseases were considered particularly important for canine well-being, whereas the importance of other inherited conditions was rated lower (Leppänen et al. 2000). This aligns with our findings, where mandatory examinations were most frequently required for musculoskeletal disorders, followed by ocular diseases. As breeders play a central role in health-related decision-making, their knowledge and attitudes significantly influence breeding outcomes, emphasizing the importance of education and evidence-based guidance in improving canine welfare (Pajtásová et al. 2025).

When breed size was considered, significant differences were detected only for selected examination categories. Mandatory examinations for musculoskeletal disorders were significantly more common in large breeds, which is consistent with the higher biomechanical load and well-documented predisposition of large and giant breeds to orthopaedic conditions (Kinga et al. 2007; Herrera-Perez et al. 2020). Conversely, ocular disease examinations

were significantly more frequently required in small breeds. This may reflect the higher prevalence of inherited ocular disorders in certain small companion breeds and the long-standing inclusion of eye screening programs in their breeding regulations (Christmas 1992; Gelatt et al. 2003; Guandalini et al. 2018). For other categories, no significant differences between small and large breeds were observed, suggesting that breed size alone is not the primary determinant of preventive health requirements.

Analysis according to breed utilization revealed even fewer differences. Significant variation was detected only for ocular diseases, which were more frequently subject to mandatory examinations in companion breeds than in working breeds. This finding may be related to differences in breeding priorities, as companion breeds are often selected more intensively for appearance, potentially increasing the risk of certain inherited ocular conditions (Mellersh 2014). Working breeds, which are commonly selected for functional performance, may retain greater genetic diversity and exhibit lower prevalence of some inherited disorders, as suggested by previous studies comparing working and show-selected populations (Pedersen et al. 2013; Wiener et al. 2017). The absence of significant differences between combined breeds and the other utilization categories further indicates that preventive breeding requirements are influenced by multiple factors rather than utilization alone.

Overall, the results indicate that current breeding approval requirements emphasize certain well-established hereditary disorders, particularly musculoskeletal diseases, while other clinically relevant conditions receive comparatively limited attention. Given the growing availability of genetic testing and standardized screening methods, broader and more consistent implementation of mandatory examinations could contribute to improved prevention of genetically determined diseases. Harmonization of breeding approval criteria across breed clubs may represent an important step toward improving canine health and welfare; however, such harmonization should remain sufficiently flexible to account for breed-specific disease predispositions, population size, genetic diversity, and other demographic characteristics to ensure that preventive strategies are appropriately tailored and proportionate.

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