

**Description of programmes in the Nordic countries
to reduce the frequency of intervertebral disc disease
(IVDD) in the dachshund population.**



SVENSKA TAXKLUBBEN
SPECIALKLUBB I SVENSKA KENNELKLUBBEN
www.taxklubben.org

December 2024

List of tables	3
List of figures	3
1. Introduction	4
2. IVDD in dachshunds	7
3. History	11
3.1 Denmark	11
3.2 Finland	14
3.3 Norway	15
3.4 Sweden	16
4. Current status	17
4.1 Denmark:	17
4.1.1 Radiography as mandatory or recommended action	17
4.1.2 Details of the programme	17
4.1.3 The effects of the programme	18
4.1.4 Research activities that have been conducted in Denmark	20
4.2 Finland	22
4.2.1 Radiography as mandatory or recommended action	22
4.2.2 Details of the program	22
4.2.3 The effects of the programs	22
4.2.4 Research activities that have been conducted in Finland:	24
4.3 Norway	25
4.3.1 X-ray as mandatory or recommendation action.	25
4.3.2 Details of the programme	25
4.3.3 The effects of the programme	25
4.3.4 Research activities that have been conducted in Norway	27
4.4 Sweden	28
4.4.1 X-ray screening as mandatory or recommendation action	28
4.4.2 Details of the programme	28
4.4.3 The effects of the programme	28
5. Future plans	31
5.1 Denmark	31
5.2 Finland	31
5.3 Norway	32
5.4 Sweden	36
6. X-ray: Mandatory or not mandatory?	38
7. Making data publicly available	40
8. How can we see results from our efforts?	41
9. Summary and Conclusion	43
Literature list	44
Appendix 1: Lawsuit against the NKK, the Norwegian Cavalier Club and the Norwegian Bulldog Club	46
Appendix 2 Flow Chart Diagram – Danish Breeding Requirements	48

List of tables

Table 1: Relationship between calcified discs and disc herniation (Beck, 2006).....	7
Table 2: Relationship between calcified discs and disc prolapse (Lappalainen et al., 2014)	8
Table 3: The correlation between the number of calcified intervertebral discs and potential ...	9
Table 4: Number of dogs x-rayed per year per population 2009-2023 in Denmark	18
Table 5: IDC degrees of dachshunds x-rayed in 2009-2023 per dachshund breeding population in Denmark.....	19
Table 6: Number of dogs x-rayed per year per population 2009-2023 in Finland.....	22
Table 7: IDC degrees of dachshunds radiographed in 2009-2023 per dachshund breeding population.....	24
Table 8: Number of dogs x-rayed per year per population 2009- November 2023 in Norway	25
Table 9: IDC degrees of dachshunds radiographed in 2009-2023 per dachshund breeding population in Norway.....	27
Table 10: Reported cases of IVDD/Disc prolapse among dachshunds, per 24 th September 2024	28
Table 11: The level of higher risk, compared to the nominal average breed.	28
Table 12: Number of dogs x-rayed per year per population 2009-2023 in Sweden	29
Table 13: IDC degrees of dachshunds radiographed in 2009-2023 per dachshund breeding population in Sweden.	30
Table 14: Number of CDDY tested dachshunds in Finland and dogs with normal allele (saved in MäykkyNet 24 th April 2024).....	31
Table 15: Number of CDDY-tested dachshunds in Norway and dogs with normal allele (saved in Dogweb 2024).....	34

List of figures

Figure 1: Number of dogs radiographed per year per population 2009-2023 in Denmark.....	19
Figure 2: Number of dogs radiographed per year per population 2009-2023 in Finland	23
Figure 3: Number of dogs radiographed per year per population 2009-2023 in Norway.....	26
Figure 4: Number of dogs radiographed per year per population 2009-2023 in Sweden.....	29

1. Introduction

The Nordic countries have a long history of close collaboration in almost every aspect of importance for a society. This is due to the geographical proximity, shared history and values, peaceful and friendly neighborhood, mutual trade agreements, open borders and to a certain extent shared languages. In the canine world, the national kennel clubs have established a common organisation called the Nordic Kennel Union. The members are Denmark, Finland, Iceland, Norway and Sweden. At the level of dachshund, the Nordic collaboration is informal, but vivid. It includes the Nordic countries apart from Iceland, as there is no dachshund club.

The dachshund population is in general a healthy breed with few serious health issues. However, research shows that approximately 20 % of the dachshund population contract intervertebral disc disease (IVDD). Each of the Nordic countries have their own programme aiming for reducing the numbers of dachshunds experiencing the disease. The programmes are developed based on research and an interest and understanding for the importance of reducing the frequency of IVDD. However, we cannot deny that the increased intensity in the IVDD prevention programmes to a certain degree is related to observations of the developing trends regarding health and welfare policies within the Nordic countries. The attention to dog health and welfare from the society at large, put an increased pressure on the breeding organisations to increase the effort to improve the health and welfare programmes. This is not a phenomenon taking place only in the Nordic countries, this is now a global issue. The Nordic countries is always influenced by European policy development; therefore, we are watching the discussions currently taking place in Germany – the homeland of the dachshund breed - closely. We are also observing the discussions in the EU regarding animal health and welfare.

In this close Nordic relationship, the dachshund breeders, owners and associations in the Nordic countries have a long and strong history of collaboration including exchange of genes, participating in each other's dog shows, blood track competitions, special Nordic dog shows and Nordic hunting test for dachshund. In May 2024, we had our first Nordic blood track competition with the Swedish Dachshund Club as host. Due to the strong relationship between the dachshund clubs in the Nordic countries, we want to collaborate closer in order to reduce the numbers of cases with IVDD in dachshund. Exchange of information is a crucial factor in that work. Thus, the aim of this document, is to provide solid information about the work each dachshund club/association in the Nordic countries is doing to prevent intervertebral disc disease. In this way, we can learn from each other and discuss improvements in our programmes. The document is also a way to show that there is a close link between the research and the development of the prevention programmes. That also contributes to facilitate research-based breeding.

As mentioned above, we are watching the discussions on animal health and welfare in Europe, in particular in Germany. However, we know that there are concerns in other European countries as well. One of the reasons for producing this document in English language is to enable other countries to get information about our prevention programmes,

and perhaps inspire new developments in this field. Based on this background, this document will be shared with both the other member states in Welt Union Teckel – the International Dachshund Club Association, and other dachshund clubs who are not members.

The main focus for this document is the x-ray screening programmes. However, the newest action line – gene testing – is also provided ample space. Other action lines are more briefly mentioned.

The document is divided into nine chapters. Each Nordic country present their own information in the following alphabetic order:

- Denmark
- Finland
- Norway
- Sweden

Terminology

Different researchers have used different terminology both for calcified intervertebral discs, and for the state of disc herniation or disc protrusion. Thus, it is necessary to clarify which specific terminology that is used in this document for these two cases.

Intervertebral disc calcification (IDC) is the term in use in this document for a condition that may lead to disc herniation.

In some charts in this document, the letter *K* appear followed by a number, for example *K0*. The letter *K* is an abbreviation used in the local languages in the Nordic countries and is synonymous with the letter *C* in IDC. When this letter occurs followed by a number, it indicates the number of intervertebral discs that are calcified.

Intervertebral disc disease (IVDD) is the term in use in this document when disc herniation or protrusion has happened. Just for your information, there are also other terms used interchangeably in research literature, for example *IDD* and *intervertebral disc herniation* (IDH).

The Authors

The authors of this document are the members of the Nordic Health Committee for Dachshund. All members of the group have been actively involved in collecting statistical information and in the writing process. The members are (in alphabetical order by country):

- Gitte Muldkjær Jensen (DK), member of the Danish Health Committee for Dachshund
- Emmi Savolainen (FI), member of the board of the Finnish Dachshund Club and the Breeding Committee of the Finnish Dachshund Club

- Marjukka Toivonen (FI), member of the Breeding Committee of the Finnish Dachshund Club
- Kjersti Grimstad (NO), member of the board of the Norwegian Dachshund Club Association and head of the Norwegian Health Committee for Dachshund,
- Tor Rynning-Torp (NO), chair of the Norwegian Federation of Dachshund Clubs and the Nordic Health Committee for Dachshund,
- Carina Olsson (SE), vice chair of the board of the Swedish Dachshund Club
- Christian Gabler (SE), member of the Swedish Breeding Committee for Dachshund

The document is approved by the boards in:

The Danish Dachshund Club

The Finnish Dachshund Club

The Norwegian Federation of Dachshund Clubs

The Swedish Dachshund Club

Acknowledgements

We thank the current leader for Dachshund Health UK, Ian Seath, for proofreading this document.

Contact information

If you have any questions or comments on the document, please send an e-mail to:

nordichealth@dachshundklubb.no

This document was last updated 11th December 2024

2. IVDD in dachshunds

From substantial research we know that the frequency of IVDD in Dachshund is estimated to be at around 20 % (Hansen, 1952, Priester, 1976, Ball et al., 1982, Nilsson, 2001, Jensen et al., 2008, Bergknut et al., 2012, Andersen and Marx, 2014, Packer et al., 2016). The disease is painful, debilitating and for some Dachshunds euthanasia is the only option.

As breeding organisations, we have a particular responsibility for the promotion of breeding resulting in healthy Dachshunds. We want to solve this problem ourselves, but the welfare of our dogs also interests the world around us. In recent years, there have been several examples of authorities acting against what is considered to be problematic breeding - for example in the Netherlands, Germany and Austria. In Norway, a lawsuit from 2023 implies that much more attention must be paid to the health aspects in breeding dogs (ref. Appendix 1). In Finland, a new law of animal welfare came into effect in 1st January 2024. Its detailed requirements remain unclear, but it is expected that there will be some legal requirements in the rules concerning the breeding of dogs, Dachshunds among other breeds. Due to a decision made by the members of the Finnish Dachshund Club in April 2024, it becomes mandatory to x-ray all dachshunds before breeding in the beginning of 2025.

The importance of the relationship between calcified discs and IVDD

In the Nordic countries, our effort to reduce the frequency of IVDD is based on research documenting that there is a strong correlation between the number of calcified intervertebral discs and the incidents of IVDD (Jensen et al., 2008, Lappalainen et al., 2014). The findings from Jensen et al. are demonstrated in the Table 1 below.

Back status/K-numbers	Number of dogs with prolapse	Number of dogs without prolapse	Total
Free (0)	1 (8 %)	11 (92 %)	12
Mild degree (K1-K2)	2 (14 %)	12 (86 %)	14
Moderate degree (K3-K4)	7 (44 %)	9 (56 %)	16
Severe degree (>K5)	12 (63 %)	7 (37 %)	19
Total	22 (36 %)	39 (64 %)	61

Table 1: Relationship between calcified discs and disc herniation (Beck, 2006).

The left column in the Table 1 shows the back status/K-number. The next column shows the number of dogs with prolapse, followed by a column showing the number of dogs without prolapse. The last column shows the total number of dogs in each group. As we can see from the Table, amongst the 12 dogs with K0, 1 dog contracted prolapse, while 11 didn't. If we look at the 19 dogs with K5 or more, 12 of the dogs contracted IVDD, 7 didn't. Altogether, of the 61 examined dogs in the study, 36 % contracted IVDD, 64 % didn't.

Lappalainen et al., 2014 did a similar study with similar findings, ref. Table 2.

Back status/K-number	Number of dogs with prolapse	Number of dogs without prolapse	Total
Free (K0)	2 (5 %)	42 (95 %)	44
Mild degree (K1-K2)	18 (25 %)	55 (75 %)	73
Moderate degree (K3-K4)	8 (30 %)	19 (70 %)	27
Severe degree (>K5)	17 (55%)	14 (45 %)	31
Total	45 (26 %)	130 (74 %)	175

Table 2: Relationship between calcified discs and disc prolapse (Lappalainen et al., 2014)

The two studies demonstrate the exact same trend. Furthermore, a British study from 2024 found the same trend (Dachshund Health UK, 2024). A study conducted by Andersen and Marx (2014) on dachshunds back health included 153 dogs:

- A total of 117 owners returned with information about their dogs' status in relation to prolapse (response rate of 76%)
- They correlated the dogs' K-numbers and back index with the presence of disc herniations with the following result:
 - Dogs with five or more calcified discs had 11 times greater risk of disc herniation compared to dogs with fewer than five calcifications
 - Dogs with back indexes below 100 had a 15 times higher risk of disc herniation compared to dogs with back indexes above 100
- The prevalence of disc herniation in the three hair varieties was 16% (wire), 17% (long) and 21% (smooth) respectively.

Also, this study supports the notion that with higher K-number, there is an increased risk for the dog to contract IVDD.

Breeding recommendation

Taking the studies described above into consideration, together with the fact that research also shows that IVDD has a strong hereditary factor (Lappalainen et al., 2015), measures need to be implemented. Thus, the Nordic countries offer x-ray screening with the purpose of evaluating the number of calcified discs in Dachshunds. If the result of the x-ray shows calcified intervertebral discs, it is important to know that a finding does not indicate illness in the dog, it must be considered as a risk factor only. The result of the x-ray is of crucial importance as a factor that breeders must be familiar with to select which dogs to choose for breeding purposes. We want to choose dogs with low numbers of calcified discs. However, that may limit the genetic diversity. Therefore, we also emphasise that if a dog with a higher number of calcified discs has traits of great importance for the breed in a larger context, then this dog could be used for one litter if the partner dog has zero or a low number of calcified discs.

To illustrate breeding advice based on the knowledge described above, we have borrowed the figure below from the Kennel Club in the UK, ref. Table 3.

The grades indicate the number of identified, calcified discs:

Grade 0 = 0
 Grade 1 = 1-2
 Grade 2 = 3-4
 Grade 3 = 5 or more

IVDD Calcification Grade for each dog		DOG ONE (sire or dam)			
		Grade 0	Grade 1	Grade 2	Grade 3
DOG TWO (sire or dam)	Grade 0	Green	Green	Green	Amber
	Grade 1	Green	Green	Amber	Red
	Grade 2	Green	Amber	Amber	Red
	Grade 3	Amber	Red	Red	Red

Table 3: The correlation between the number of calcified intervertebral discs and potential incidents of IVDD ([The Kennel Club](#) 2023)

The Kennel Club explains that the **green colour** marks the lowest risk of breeding dogs affected by IVDD. The **amber colour** marks A higher risk of producing puppies that may grow up to be affected by IVDD. The **red colour** marks that a mating that has a high risk of producing puppies that may grow up to be affected by IVDD. These matings are not recommended. IVDD can have a serious impact on a dog’s health and welfare, so a mating which has a high risk of producing affected puppies should never knowingly be carried out.

In Denmark, Finland and Norway, screening programmes using x-ray for identifying potential calcified intervertebral discs, have been available since the beginning of the 21st century. Sweden launched their programme in 2021. To take part in the screening, the dachshund owner buys a requisition from the kennel club and bring that and the dog to an approved clinic for the x-ray screening. The dog must be sedated. The x-rays are sent to a reader/evaluator who is trained to read this kind of x-ray and is approved by the kennel club. The results are publicly available in the kennel club database.

Another breeding advice which has been pursued especially in Sweden, is to avoid breeding from dogs that have had IVDD or that have had IVDD in the family. To achieve this, breeding on dogs that are at least 3 years old is recommended. The parents of these dogs will be at least six years old, and it will often be possible to obtain information on the parent dogs - that they have not had any back problems. Both the Norwegian and the Swedish breeding club also has a system of voluntary reporting of IVDD cases to databases managed by the kennel clubs.

New developments

In 2023, both Finland and Norway launched a new screening programme in the shape of a gene test. Likely, the FGF4-12 is the gene variant that has the greatest significance for whether a dog develops disc herniation or not. Therefore, reducing the frequency of FGF4-12 is also a way to address the problem. Since the frequency of the normal gene (wild type) variant in the Dachshund population is now very, very low, this must happen extremely gradually, but efforts should be made to increase the frequency of the wild type. The fact that not all dachshunds develop IVDD, even if they have one or two copies of FGF4-12, indicates that other factors also affect the risk to a certain extent, such as other modifying genes.

Upon agreement with Norway, Sweden offers dog owners the possibility of becoming part of the Norwegian gene testing project. Denmark has started looking into gene testing. The current aim of gene testing is to identify the frequency of the wild-type gene.

Where do we go from here?

As many Dachshunds will still have one or two copies of FGF4-12 for generations to come, the gene testing described above cannot replace x-ray screening. In parallel with reducing the frequency of FGF4-12, we also must select dogs with a lower risk of prolapse among the dogs that still carry FGF4-12, by x-ray screening. Consequently, the most effective strategy for improving back health in Dachshunds is to:

- Reduce the risk among those dogs that still carry FGF4-12, by x-raying the dogs and only breeding the dogs with no or few calcified intervertebral discs. If a dog with a higher number of calcified discs has traits that is of great importance for the breed in a larger context, then this dog could be used for one litter if the partner dog has zero or a low number of calcified discs.
- Gradually reduce the frequency of the underlying risk factor, FGF4-12, by DNA testing (selected) dogs, and prioritize using dogs that carry at least one copy of the normal gene variant in breeding.

3. History

This chapter provides information about the start and development of the x-ray screening programmes in the Nordic countries.

3.1 Denmark

From both anecdotes and evidence, we know that it has long been known that there was a problem with the dachshund's back. In the past people just seemed to accept this as a sad fact.

After the middle of the last century, increased prosperity came and we moved out in large numbers to the suburban housing estates, where the dachshund jumped into our beds and sofas. With that came less acceptance of our dogs' suffering. Danish Dachshund Club members began to expect (demand) the club to do something to solve the problem.

The club thus set up its first health committee in the mid-1980s. The committee began its work with a literature search. It showed that there was a lot of knowledge about the occurrence and treatment, but not so much knowledge about heredity and prevention.

In 1993-1994, the committee collected material on 25 litters of short-haired dachshunds, where at least one puppy in each litter had IVDD. The material was used for a veterinary paper, which was published in 1995 (Andersen, 1995). The uplifting conclusion of the study was that predisposition for IVDD is largely hereditary and that the environment probably plays a smaller role than previously assumed.

In the context of this study, a theory regarding serum albumin was tested - the theory could not be confirmed. The Danish Kennel Club provided financial support. An interesting observation was that breeders were more likely not to use females for breeding if they had suffered from IVDD, while they were willing to use males that had suffered IVDD.

The material also included a litter in which one of the puppies had been exported abroad. Nothing was known about this one as to whether it had suffered from IVDD. All the other puppies in the litter were known to have had IVDD. The mother of the litter later had a litter of eight puppies with another male dog - none of these puppies had IVDD. This example reinforced the notion of a strong hereditary component.

With inspiration from, among other things, the above-mentioned Frøkjær Jensen chose to write her PhD on back disorders in dachshunds and in May 1995, the club's magazine called for dogs for a project on back disorders in dachshunds. The study followed up on earlier research by, among others, Havránek-Balzeretti (1980) and Stigen (Stigen, 1991, Stigen and Christensen, 1993). Dachshund owners readily made their dogs available for the project. The participation was quite extensive. More than one hundred dogs participated, and many dogs were X-rayed several times so that the development of the calcifications could be followed over time.

Frøkjær Jensen's project showed good results early on and she informed the dachshund club about this. Her most significant breakthrough in relation to Havranek-Balzeretti and Stigen was the discovery of the optimal period (2-3½ years, later 2-4 years). She also showed very high heritability, thanks among other things, to a focus on high image quality.

But how could we transform the promising results to a screening program that could work? The Danish Kennel Club, Frøkjær Jensen and the veterinary college provided invaluable help and recommended, among other things:

- Learn from the experiences – good and bad – of other screening programs, especially HD
- Image quality is important (supervision for veterinarians).
- Vets' understanding and loyalty is important.
- Information for members, especially the breeders, is important.
- Before any screening program comes into force, an incidence study should be carried out, so that it will be possible to measure the effect many years later.
- Avoid "pre-imaging"
 - Pre-imaging is when a dog undergoes imaging before the official examination. Pre-imaging is a bad idea because:
 - It exposes the dog to unnecessary discomfort. The discomfort is modest but unnecessary and therefore not acceptable.
 - It is a waste of money. The diagnostic uncertainty before the dog is 24 months old is significant.
 - Un-necessary X-ray images should be avoided for the sake of X-ray hygiene.
 - We breed in a community, and all results are important to know - not only for the owner but also for other breeders of the breed.
 - It is detrimental to indexing if the material is selected.

In other words, pre-imaging is unethical and simply cheating. Consequently, the Danish rules for participation state that dogs previously examined for calcification screening cannot participate.

In a series of articles based on Frøkjær Jensen PhD in 2000, showed that there was a basis for the introducing of a screening programme (Jensen and Arnbjerg, 2001, Jensen and Ersbøll, 2000, Jensen and Christensen, 2000, Jensen, 2001). A course was held for veterinarians in recording technique, an agreement was reached with the Veterinary Association on price and terms, registration in DKK's database, Hundeweb, was agreed upon, lectures and a seminar were held for club members, articles were written for the member's magazine and much, much more. It really takes a lot to transform research results into a screening program that can work in practice.

In 2001, Schriver Nilsson conducted a population study on wire-haired dachshunds born in 1991 (Nilsson, 2001). The study showed an overall incidence of 20.3 %.

Everyone who had participated in Frøkjær Jensen's project was informed of their dog's result and was offered the possibility that the result could be registered in DKK's database. Almost everybody said yes. There was a clear tendency for those who declined to be those who had dogs with poor results.

In 2002 we were ready to offer X-ray examination as an open offer for all DKK-registered dachshunds. The club provided a financial subsidy if you were a member of the club.

In 2006, Beck investigated the relationship between calcification and IVDD. In the study, a strong correlation was seen – among dogs with few calcifications, very few had IVDD, while as many as 63% of the dogs with 5 or more calcifications had IVDD (Beck, 2006).

In 2009, the then board of the Danish Dachshund Club decided to apply to DKK to make back examinations mandatory. DKK accepted the application and X ray screening was now a requirement for all dachshunds. Dogs which at that time were older than 3½ years and therefore too old to be included were not covered by the restriction and there was a so-called "free litter" - that is to say, X-ray screening was only a requirement if a dog was to have more than one litter. There was no requirement in relation to status.

In 2013, the restriction was suspended pending the results of a new research project 100 (Andersen and Marx, 2014). X-ray screening was now again only a recommendation. The project was primarily to investigate incidence of IVDD and correlation between the number of calcifications and the risk of IVDD.

In 2014, Andersen/Marx defended their master thesis. They found that the incidence for wire hair was 16 %, for long hair was 17.43 % and for smooth hair it was 21.57 %. They found that dogs with 5 or more than 5 calcifications had an 11 times higher risk than dogs with fewer than 5 calcifications and they found that dogs with an index lower than 100 had a more than 15 times greater risk of IVDD than dogs with an index equal to or higher than 100 (Andersen and Marx, 2014).

In 2017, a new breeding restriction was introduced that made X-ray screening mandatory for all male dogs. There was no requirement according to status.

2019. Again, a new restriction. Everyone – including bitches – had be X-ray screened. Requirements and recommendations were now also introduced in relation to status and index.

2021. Adjustments. Relaxations in relation to foreign, non-examined dogs and changes with more emphasis on individual status and less on index.

In the whole period Vibeke Frøkjær Jensen has been the reader of all X-rays in Denmark. She and Anu Lappalainen are members of a subcommittee under the Nordic Kennel Club Union (NKU), Scientific Committee

3.2 Finland

Spinal x-ray screening of dachshunds started in 1998 as a research project, which depicted 124 miniature dachshunds. After that, the spinal radiographic screening of the breed club Finnish Dachshund Club (FDC) began. Dogs of all ages received a grade for intervertebral disc calcifications (IDC) based on the number of calcified intervertebral disc, the results also indicated whether the dog was x-rayed at the recommended age of 24-42 months. The spinal radiographing protocol was transferred to the Finnish Kennel Club's control on 1st June 2013, and at the same time, dogs also started receiving grades for three other conditions¹. The Finnish Kennel Club (FKC) records the results for all dogs over 24 months old. In November 2022, FKC introduced back index for intervertebral disc calcification. If a dog is x-rayed beyond its ideal age range, it affects scoring reliability. Veterinarian Anu Lappalainen has been grading spinal images from the beginning. In addition to her, veterinarian Vilma Reunanen also started evaluating back x-ray images in 2023. The breed club FDC has been providing financial support for spinal imaging for a long time. However, since 2023 this support has become taxable which has reduced applications for support. Some local dachshund clubs have also provided spine imaging support in addition to FDC's support.

¹ lumbosacral transitional vertebra (LTV), vertebral anomaly (VA), and spondylosis (SP).

3.3 Norway

Veterinarian Øyvind Stigen at the Norwegian School of Veterinary Science (NVH) wrote in an article in *Dachshunden* in 1987 that they were working on a survey of intervertebral disc herniation in dachshunds. In this regard, they wanted to X-ray 250-300 dogs. In 1991, Stigen submitted a report on calcified intervertebral discs in young Dachshunds. Recruiting dogs for spinal X-rays was slow, and it wasn't until 9th March 2001, that a breeder seminar on disc herniation in Dachshunds was held. The invited experts at the meeting were veterinarian Øyvind Stigen, who had obtained a doctorate on the topic, and veterinarian Olav Nørgaard from Denmark. The breeder seminar gathered 43 members. On 22nd September 2001, the first official result of spinal X-ray of dachshund was registered in Norway.

To encourage dachshund owners to have their dogs undergo spinal X-rays, members have had access to financial support from the Norwegian Dachshund Federation (NDF), and several of our 16 local clubs have also had their own arrangements. In January 2010, based on the realization that the back problem was more significant than initially thought, a letter was sent to 1.700 Dachshund owners who had a total of 2.200 Dachshunds aged 2-4 years, urging them to have their dogs undergo spinal X-rays. NDF provided financial support, even to non-members at this time.

From the first day until 14th May 2020, we had veterinarian Øyvind Stigen (who later became a professor) from NMBU School of Veterinary Science as the reader of the X-rays. He was relieved by veterinarian Marte Ottesen beginning from 17th June 2020 and ended 9th February 2021. After this period until the fall of 2021, we had no reader until veterinarian Vibeke Frøkjær Jensen from Denmark took on the task.

Breed-Specific Breeding Strategy (RAS)

RAS was developed in 2015 and has a comprehensive and clear chapter on disc herniation and spinal X-rays. The chapter is based on well-established research. The text explains both the problem and how the results of spinal X-rays can be a means of preventing disc herniation effectively. RAS specifies that an important goal is for all parent dogs to have a known spinal status, and several measures are suggested to increase participation in the spinal program. Despite RAS, participation in the spinal X-ray program has been inadequate. Thus, the number of X-rayed dogs is still too low to establish an index as a tool for breeders.

3.4 Sweden

The possibility to screen dachshunds officially in Sweden, came during the summer of 2021. Until then dachshund owners that wanted to x-ray their dogs, had done so by either travelling to neighbouring Nordic countries, or by x-raying at “their veterinarian” in Sweden and sending the shots to be evaluated in another Nordic country.

The program started with the Breeding Committee of The Swedish Kennel Club as the driving force, arguing for the need to address the problem of IVDD, the necessity to consider scientific findings and the wish to harmonize with Nordic neighbours and their IVDD programs.

The official possibility to purchase a requisition to back x-ray at The Swedish Kennel Club for an IDC reading, was launched in agreement with The Breeding Committee of The Swedish Dachshund Club, early in 2021. In the spring of the same year, the programme was launched with the first readings and results being registered in June of 2021.

Information about the new possibility to x-ray your dachshund, was presented in the member magazine “Taxen”, on the webpage and social media of The Swedish Dachshund Club and of course also on the webpage of The Swedish Kennel Club.

As of now (April 2024) there has never been a financial support to dog owners that perform an x-ray investigation. It would perhaps be fair to mention that it is still early in the time span of this new programme. The matter of financial support will most likely be looked at, as the process of evaluating the programme makes progress.

A fair question is why Sweden started offering official x-ray screening through the Kennel Club, so much later than the Nordic neighbours. It was in any case clear early on, that it was very difficult to get acceptance among breeders, for an x-ray screening program. It was also argued that it was “suspicious” to have to let the x-rays be evaluated by a foreign reader. “Why could not this competence be found in Sweden?” Some others also pointed out, the option of waiting longer to see what the programs in the other countries resulted in. This would lead to not repeating “beginner’s mistakes” that perhaps were made by our neighbours. It has been important for the Swedish Dachshund Club, to follow and study the work and results in our neighbour countries.

What can be said about the current status is that the discussions have matured and taken steps forward and a new view on matters is developing. In any case, the matter of acceptance among breeders and dachshund owners is still an important aspect to consider. Many are still sceptical towards what a screening actually has to say, about the dog that is screened and about its standing as a breeding dog.

4. Current status

This chapter is divided into four sections and four sub-sections. Each country describes the current status of their programmes in terms of radiography as mandatory or recommended action. This is followed by information on details of the programme, and research activities related to their programmes. In addition to research, health investigations are included.

4.1 Denmark:

4.1.1 Radiography as mandatory or recommended action

Spinal x-ray imaging is mandatory.

4.1.2 Details of the programme

The Danish Dachshund Club has developed the following breeding requirements concerning dachshund screening for IDC 2021:

Breeding requirements.

Offspring can be given a Pedigree if, before the breeding, both parents have a DKK registered spine screening. The screening must have taken place when the dog is between 24 and 48 months old. Dogs which have been graded K0 (no calcification), K1 (one calcification), K2 (two calcifications), K3 (three calcifications) and K4 (four calcifications) can be used in breeding without any restrictions.

Exceptionally dogs with a screening result of K5 (five calcifications) or more may be used in breeding if the breeder finds that the dog's total contribution to the breed will be positive. In this case the breeding partner must always have been graded with K0, K1 or K2, and the breeder may be asked to reason his/ her choice to the DKK.

Dogs without a spine screening, born before 1.1.2017.

Exceptionally dogs which are four years at the time when the breeding requirements came into force, and which therefore cannot be screened, may be used in breeding if the breeder finds that the dog's total contribution to the breed will be positive. In this case the breeding partner must always have been graded with K0, K1 or K2, and the breeder may be asked to reason his/ her choice to the DKK.

The breeding requirements concern all Danish owned dogs as well as foreign owned breeding dogs located in Denmark on an outline statement.

Breeding recommendations.

To be given Basic Plus Pedigrees, apart from the above breeding requirements, the following demands must be fulfilled:

- 1. Both parents must have a DKK registered spine screening of K0, K1 or K2, or the average of the screening of both parents must be 100 or above at the time of breeding.*
- 2. Concerning wire-haired dachshunds: At least one of the parents must be registered genetically free from CRD-PRA and OI in Denmark.*

Mating with foreign stud dogs.

At the time being, the DKK registers spine screening results from Norway, Sweden, Finland and England. Foreign males which have a DKK registered spine screening meet the same breeding requirements as Danish dogs.

Foreign males which do not have a DKK registered spine screening may be used in breeding if the breeder finds that the dog's total contribution to the breed will be positive. In this case the breeding partner must always have been graded with K0 – K4, and the breeder may be asked to reason his/ her choice to the DKK.

([Source: Danish Dachshund Club](#))

The breeding requirements are also presented in a flow chart, ref. appendix 3.

For the result of spinal X-rays to be registered in our Hundeweb, the dog must be of the correct age (2-4 years), and a referral must be ordered through the DKK (Danish Kennel Club) before the X-ray examination. Only readings done by DKK's reader are valid and can be registered in Hundeweb and all results are registered and published in Gravhunden (Danish Dachshund Club Magazine). Only veterinarians with an agreement with the DKK who have completed an approved X-ray course are allowed to take this type of images.

4.1.3 The effects of the programme

Table 4 shows the numbers of x-rayed dachshunds from 2009 to 2023. The numbers for the miniature and rabbit sized dogs are merged for each type of fur.

YEAR	MW+RW	W	MS+RS	S	ML+RL	L	TOTAL
2009	7	42	3	16	25	8	101
2010	24	50	10	22	34	9	149
2011	20	36	14	26	28	11	135
2012	12	31	6	11	28	4	92
2013	8	27	0	12	8	6	61
2014	12	20	1	7	8	5	53
2015	9	21	0	4	7	4	45
2016	12	33	0	18	10	2	75
2017	15	23	1	3	11	5	58
2018	20	32	1	15	14	6	88
2019	26	34	9	12	29	10	120
2020	17	29	8	27	23	14	118
2021	24	53	6	13	25	11	132
2022	23	48	9	17	32	9	138
2023	27	41	8	27	35	12	150
TOTAL	256	520	76	230	317	116	1515

Table 4: Number of dogs x-rayed per year per population 2009-2023 in Denmark

Table 4 shows that in the period 2009-2023, 1.515 dogs were X-rayed. Most X-rayed dogs belong to the wire-haired dachshund standard size, followed by miniature and rabbit sized long-haired. Next in line are miniature and rabbit wire-haired, standard smooth-haired, standard long-haired, and finally miniature and rabbit sized smooth-haired dachshunds. The smooth-haired population is the least represented among the breed variants in the Table, which is also reflected in the number of registered dachshunds in the DKK.

The Table also indicates a significant decrease in the number of X-rayed dogs during the period 2012-2018. From 2019, the number of x-rayed dogs has increased annually.

Figure 1 below presents the information in Table 3 in a different way.

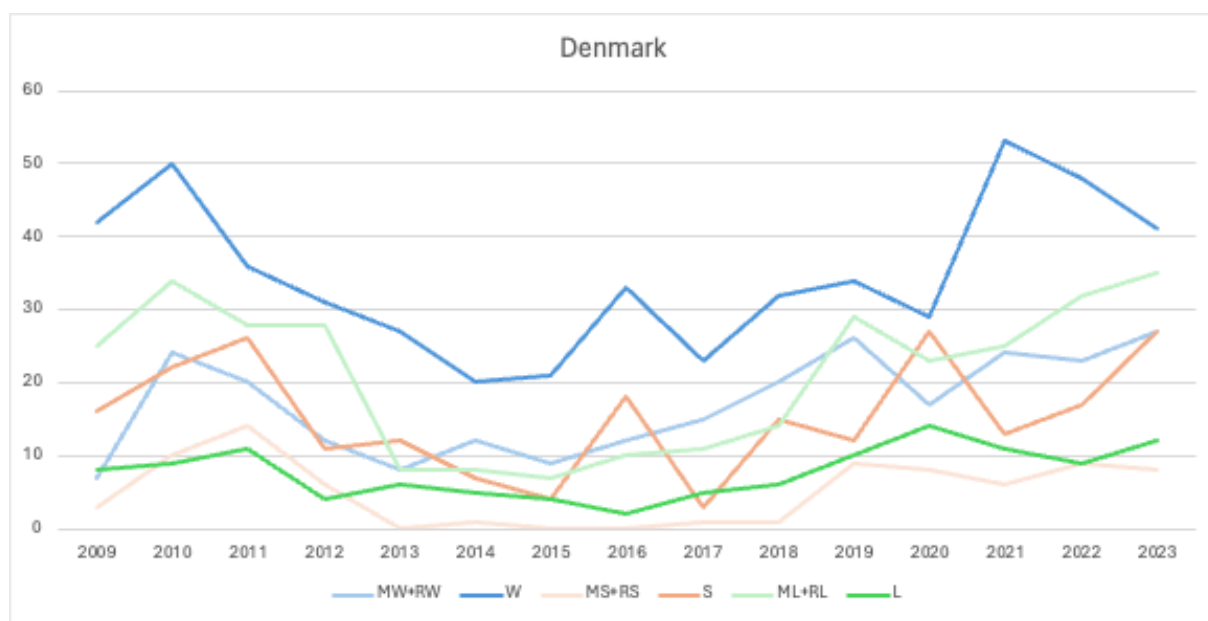


Figure 1: Number of dogs radiographed per year per population 2009-2023 in Denmark

Figure 1 shows the IDC degrees of dogs radiographed in 2009–2023 per dachshund breeding population. Number of dogs in each population is on the left, percentage of the IDC degree is on the right. The peaks on both ends are striking.

In the period from 2012/2013 to 2018, there was a significant decrease in the number of dogs examined. The explanation is probably that during this period X-ray is only a recommendation, not mandatory.

Table 5 shows the IDC degrees of the dachshunds that were x-rayed in 2009-2023.

	MW+RW	%	W	%	MS+RS	%	S	%	ML+RL	%	L	%	total	%
IDC 0	47	18,4	117	22,5	6	7,9	26	11,3	62	19,6	16	13,8	274	18,1
IDC 1	97	37,9	193	37,1	23	30,3	66	28,7	141	44,5	53	45,7	573	37,8
IDC 2	58	22,7	125	24	22	28,9	65	28,3	73	23	27	23,3	370	24,4
IDC 3	54	21,1	85	16,3	25	32,9	73	31,7	41	12,9	20	17,2	298	19,7
total	256		520		76		230		317		116		1515	

Table 5: IDC degrees of dachshunds x-rayed in 2009-2023 per dachshund breeding population in Denmark.

Table 5 shows a remarkable difference between the variants. The proportion of dogs with more than 4 calcifications is significantly higher in the short-haired variants: both the small and the large, than with the other coat variants. In the long-haired variants, the proportion of dogs with few calcifications is higher in the small variants than in the large ones, while the picture is reversed in the wire-haired variants.

It is still too early at population level to document progress as a result of back examinations. This is due, among other things, to the above-mentioned changes between voluntary and mandatory, but primarily because breeding takes time. The dogs must be at least two years old at the time of the X-ray examination and X-rayed dogs must have offspring that are at least two years old, have been examined and have offspring, i.e.

But - we know:

- that dogs with few calcifications have a low risk of disc herniation and that dogs with many calcifications have a high risk of disc herniation. This has been confirmed by several studies in both Denmark and Finland.
- that there is high heritability - offsprings after dogs with many calcifications have a high risk of also having many calcifications and offsprings after dogs with few calcifications have a good chance of having few calcifications. This has also been documented - but not yet at population level.

4.1.4 Research activities that have been conducted in Denmark

- Andersen, A. 1995. Discusprolaps hos gravhund. Årsagsforhold, heritabilitet, diagnose. [Discherniation in dahshund. Causes, heritability, diagnosis.]. Hovedoppgave [Masters Degree Dissertation].
- Andersen, C. M. & Marx, T. 2014. Diskusprolaps hos gravhunde. Incidens studie og follow-up studie på rygfotografering og brugen af K-status og indekstal [Disc prolapse in dachshund. An incidens and follow up study in X-ray and the use of K status and index]. Kandidat i veterinærmedicin Speciale, Københavns universitet.
- Beck, S. 2006. Disk-degenerasjon hos gravhund - et klinisk, radiologisk follow-up studie. [Disc-degeneration in Dachshund, a clinical, radiological follow-up Study.]. Veterinært speciale. .
- Bruun, C. S., Bruun, C., Marx, T., Proschowsky, H. F. & Fredholm, M. 2020. Breeding schemes for intervertebral disc disease in dachshunds: Is disc calcification score preferable to genotyping of the FGF4 retrogene insertion on CFA12? Canine Medicine and Genetics, 7, 18.
- Jensen, V. F. 2001. Asymptomatic radiographic disappearance of calcified intervertebral disc material in the Dachshund. Vet Radiol Ultrasound, 42, 141-8.
- Jensen, V. F. & Arnbjerg, J. 2001. Development of intervertebral disk calcification in the dachshund: a prospective longitudinal radiographic study. J Am Anim Hosp Assoc, 37, 274-82.
- Jensen, V. F., Beck, S., Christensen, K. A. & Arnbjerg, J. 2008. Quantification of the association between intervertebral disk calcification and disk herniation in Dachshunds. Journal of the American Veterinary Medical Association, 233, 7.
- Jensen, V. F. & Christensen, K. A. 2000. Inheritance of Disc Calcification in the Dachshund. Journal of Veterinary Medicine Series A, 47, 331-340.
- Jensen, V. F. & Ersbøll, A. K. 2000. Mechanical factors affecting the occurrence of

- intervertebral disc calcification in the dachshund--a population study. *J Vet Med A Physiol Pathol Clin Med*, 47, 283-96.
- Mogensen, M. S., Karlskov-Mortensen, P., Proschowsky, H. F., Lingaas, F., Lappalainen, A., Lohi, H., Jensen, V. F. & Fredholm, M. 2011. Genome-wide association study in Dachshund: identification of a major locus affecting intervertebral disc calcification. *Journal of Heredity*, 102, S81-S86.
- Mogensen, M. S., Scheibye-Asing, K., Karlskov-Mortensen, P., Proschowsky, H. F., Jensen, V. F., Bak, M., Tommerup, N., Kadarmideen, H. N. & Fredholm, M. 2012. Validation of genome-wide intervertebral disk calcification associations in dachshund and further investigation of the chromosome 12 susceptibility locus. *Frontiers in genetics*, 3, 225.
- Nilsson, N. S. 2001. Diskusprolaps hos gravhund - en populasjonsundersøgelse. Kandidat i veterinærmedicin [Disc prolapse in dachshund – an investigation of a population] Speciale, Den Kgl. Veterinær- og Landbohøjskole.
- Nørgaard, O., Proschowsky, H. F. & Byskov, K. 2012. Evaluering av DHK's rygprogram [Evaluation of Danish Dachshund Club's back health program]. Gravhunden. 3: Dansk Gravhunde Klub.

4.2 Finland

4.2.1 Radiography as mandatory or recommended action

X-ray screening has remained a recommendation so far, as the decision to make it mandatory for breeding dogs must be made at the general meeting of FDC, where the majority has opposed mandatory imaging. In 2022 the general meeting even demanded removing the recommendation not to breed two IDC grade-3 dogs with each other. Due to a decision made by the general meeting of FDC in April 2024, it becomes mandatory to screen all dachshunds before breeding, except dogs older than 8 years without IVDD symptoms.

4.2.2 Details of the program

FDC has encouraged its members to have their dogs radiographed by providing financial support and supported its local clubs to organize radiography events. It is recommended that at least one of the parents in a litter has an IDC grade. Litters with both parents having been radiographed can access the Finnish Dachshund Club's puppy list free of charge.

4.2.3 The effects of the programs

Table 6 shows the numbers of x-rayed dachshunds from 2009 to 2023. The numbers for the miniature and rabbit sized dogs are merged for each type of coat.

YEAR	MW+RW	W	MS+RS	S	ML+RL	L	TOTAL
2009	7	39	3	15	21	33	118
2010	13	45	0	12	16	20	106
2011	7	36	3	25	24	35	130
2012	6	48	3	13	23	31	124
2013	4	18	1	13	24	25	85
2014	8	38	6	16	48	23	139
2015	6	21	2	11	24	14	78
2016	5	13	9	14	30	11	82
2017	7	9	7	11	32	20	86
2018	6	12	2	15	28	9	72
2019	6	17	8	22	24	6	83
2020	9	18	11	24	38	9	109
2021	13	33	14	24	29	11	124
2022	11	24	19	29	35	10	128
2023	18	52	30	57	50	23	230
TOTAL	126	423	118	301	446	280	1694

Table 6: Number of dogs x-rayed per year per population 2009-2023 in Finland

Table 6 shows that in the period 2009-2023, 1694 dogs were X-rayed. Most X-rayed dogs belong to the long-haired miniature and rabbit sizes, followed by wire-haired standard. Next in line are smooth-haired standard sized, long-haired standard, miniature and rabbit sized wire-haired, and finally miniature and rabbit sized smooth-haired dachshunds.

The Table also indicates a decrease in the number of X-rayed dogs during the period 2015-2018.

Figure 2 below presents the information in Table 3 in a different way. The peaks in both ends are striking. One interpretation is that when the programme was new, the expectations may have been high. The next years indicate a low interest, and the peak at the right side show a renewed interest.

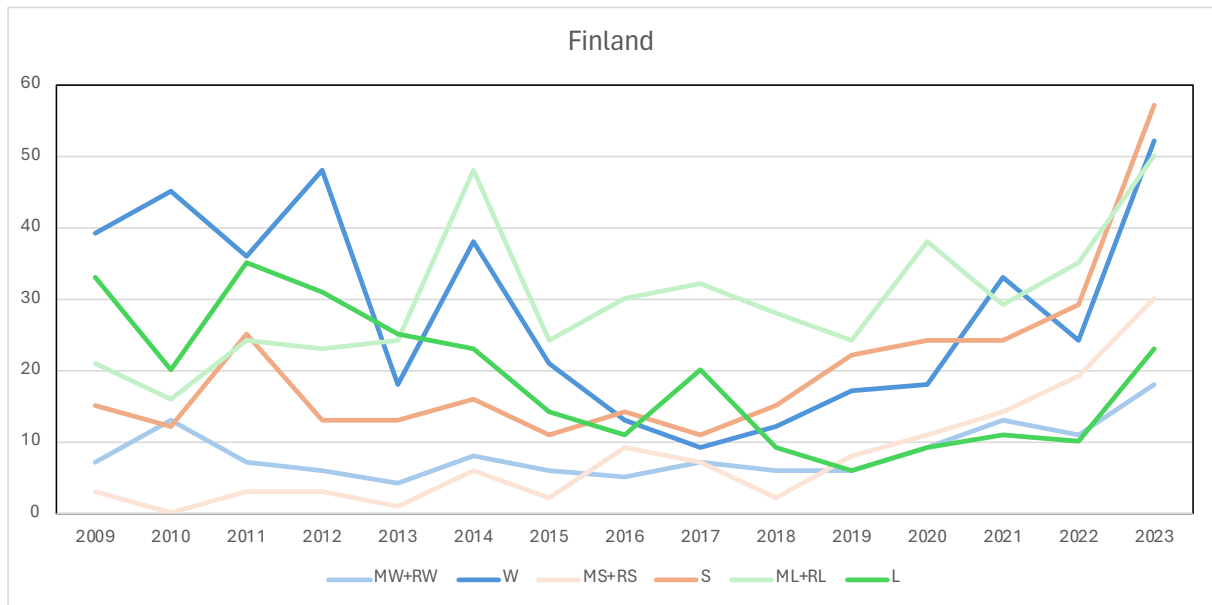


Figure 2: Number of dogs radiographed per year per population 2009-2023 in Finland

Figure 2 shows that the use of x-ray screening has not been in systematic use as a tool for breeding. Thus, it is impossible to say anything about the wanted effect of it yet. Long-haired miniatures are the only population where results have been systematically used as a tool for breeding; in this population, improvement in IDC grades can be seen. However, in 2023, when more dogs from lines that had not previously been x-rayed were examined, a higher percentage of IDC3 was observed compared to lines from which dogs have been x-rayed for several generations. This finding exists in all breeding populations.

We don't know whether the number of affected dogs has increased or not because the FDC only has a vague idea of that. Owners have been encouraged to report their dog's health, but very few have done so. It is also possible for the owner to report the cause of death in FKC KoiraNet database, but those reports are not telling if the dog has had IVDD if that has not been the cause of death.

Table 7 at the next page, shows IDC degrees of dogs radiographed in 2009–2023 per dachshund breeding population. Number of dogs in each population on the left, percentage of the IDC degree on the right:

	MW+RW	%	W	%	MS+RS	%	S	%	ML+RL	%	L	%	total	%
IDC0	19	15,1	104	24,6	14	11,9	59	19,6	140	31,4	62	22,1	398	23,5
IDC1	37	29,4	<u>139</u>	<u>32,9</u>	29	24,6	<u>102</u>	<u>33,9</u>	<u>159</u>	<u>35,7</u>	<u>108</u>	<u>38,6</u>	574	33,9
IDC2	26	20,6	92	21,7	29	24,6	72	23,9	81	18,2	64	22,9	364	21,5
IDC3	<u>44</u>	<u>34,9</u>	88	20,8	<u>46</u>	<u>39</u>	68	22,6	66	14,8	46	16,4	358	21,1
total	126		423		118		301		446		280		1694	

Table 7: IDC degrees of dachshunds radiographed in 2009-2023 per dachshund breeding population

Table 7 shows that there are significant differences between the breeds. The lowest proportion of IDC0 results is found in wire-haired miniature dachshunds and smooth-haired miniature dachshunds, whereas among long-haired miniature dachshunds, the proportion of IDC0 is the highest in the populations. The findings with the highest score are underlined. In the miniature wires and smooths it is IDC3. In other variants, the most common finding is IDC1. In total the most common finding is IDC1.

4.2.4 Research activities that have been conducted in Finland:

- Lappalainen, A., Norrgård, M., Alm, K., Snellman, M. & Laitinen, O. 2001. Calcification of the intervertebral discs and curvature of the radius and ulna: a radiographic survey of Finnish miniature dachshunds. *Acta Veterinaria Scandinavica*, 42, 1-8.
- Lappalainen, A. K., Mäki, K. & Laitinen-Vapaavuori, O. 2015. Estimate of heritability and genetic trend of intervertebral disc calcification in Dachshunds in Finland. *Acta Veterinaria Scandinavica*, 57, 6.
- Lappalainen, A. K., Vaitinen, E., Junnila, J. & Laitinen-Vapaavuori, O. 2014. Intervertebral disc disease in Dachshunds radiographically screened for intervertebral disc calcifications. *Acta Veterinaria Scandinavica*, 56, 7.
- Reunanen, V. L. J., Jokinen, T. S., Hytönen, M. K., Junnila, J. J. T. & Lappalainen, A. K. 2023. Evaluation of intervertebral disc degeneration in young adult asymptomatic Dachshunds with magnetic resonance imaging and radiography. *Acta Veterinaria Scandinavica*, 65, 42.
- Rohdin, C., Jeserevic, J., Viitmaa, R. & Cizinauskas, S. 2010. Prevalence of radiographic detectable intervertebral disc calcifications in Dachshunds surgically treated for disc extrusion. *Acta Veterinaria Scandinavica*, 52, 1-7.
- Rosenblatt, A. J., Lappalainen, A. K., James, N. A., Webster, N. S. L. & Caraguel, C. G. B. 2018. Scorer and modality agreement for the detection of intervertebral disc calcification in Dachshunds. *Acta Veterinaria Scandinavica*, 60, 11.

4.3 Norway

4.3.1 X-ray as mandatory or recommendation action.

The X-ray program in Norway holds the status of a recommendation. It is recommended that both parents should have a known spinal status, and the X-rays should be taken at the age of 2-4 years.

4.3.2 Details of the programme

For the result of spinal X-ray screening to be registered in Dogweb, the dog must be of the correct age (2-4 years), and a referral must be ordered through the NKK (Norwegian Kennel Club) before the X-ray examination. Only readings done by NKK's appointed reader are valid and can be registered in Dogweb. Only veterinarians with an agreement with the NKK who have completed an approved X-ray course are allowed to take this type of images.

4.3.3 The effects of the programme

Table 8 show the numbers of x-rayed dachshunds from 2009 to 2023. The numbers for the miniature and rabbit sized dogs are merged for each type of coat.

YEAR	MW+RW	W	MS+RS	S	ML+RL	L	TOTAL
2009	5	4	12	1	7	4	33
2010	3	46	5	7	39	20	120
2011	6	16	7	11	19	17	76
2012	8	29	6	15	26	16	100
2013	5	9	2	7	14	14	51
2014	1	13	3	5	9	8	39
2015	7	10	2	2	7	11	39
2016	4	3	1	4	9	13	34
2017	4	6	2	2	4	13	31
2018	1	7	0	2	9	9	28
2019	6	2	2	2	7	14	33
2020	4	2	1	1	7	8	23
2021	6	8	0	7	10	16	47
2022	10	21	8	19	40	31	129
2023	10	20	0	14	55	34	133
TOTAL	80	196	51	99	262	228	916

Table 8: Number of dogs x-rayed per year per population 2009- November 2023 in Norway

Table 8 shows that in the period 2009-2023, 916 dogs were X-rayed. Most X-rayed dogs belong to the long-haired dachshund standard size, followed by miniature and rabbit sizes. Next in line are standard wire-haired, standard smooth-haired, miniature and rabbit-sized wire-haired, and finally, miniature and rabbit-sized smooth-haired dachshunds. The smooth-haired population is the least represented among the breed variants in the Table, which is also reflected in the number of registered dachshunds in the NKK.

The Table also indicates a significant decrease in the number of X-rayed dogs during the period 2013-2021. The number of X-rayed dogs in 2022 and 2023 has more than doubled compared to 2021, which we attribute to the impact of the new spine X-ray program adopted in 2022.

Figure 3 below presents the information in Table 3 in a different way.

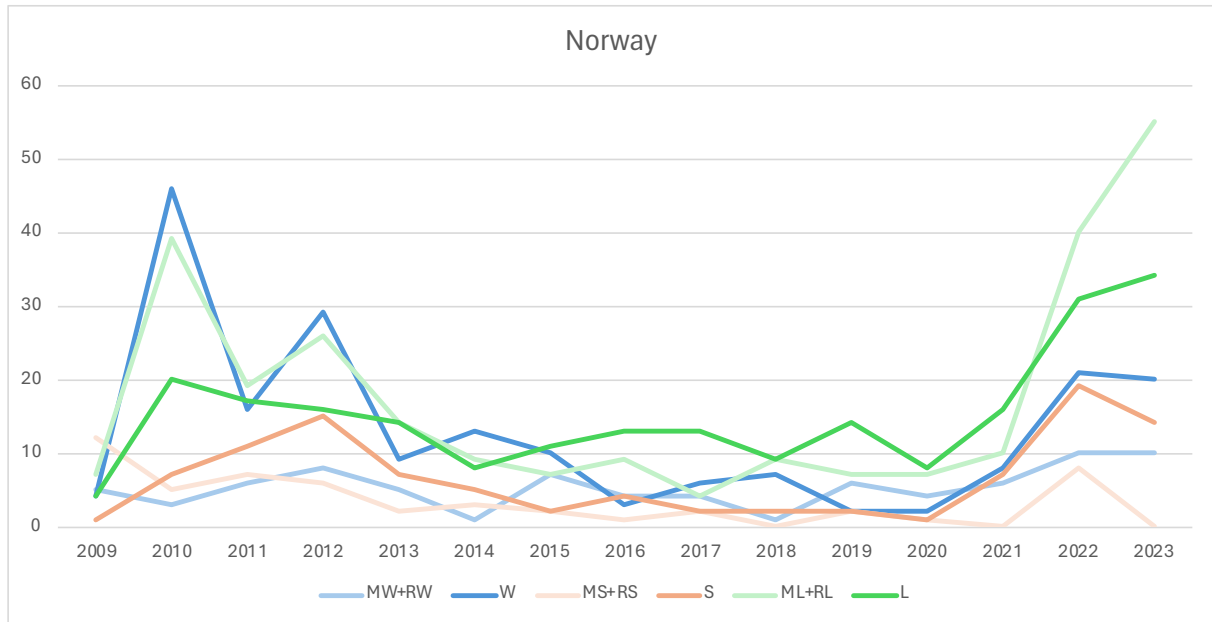


Figure 3: Number of dogs radiographed per year per population 2009-2023 in Norway

Variation in the Number of X-rayed Dogs

Figure 3 shows that there has been significant variation in the number of Dachshunds undergoing in X-ray screening annually. For example, in 2008, there were 7 Dachshunds X-rayed. In 2010, there were 110, in 2012, there were 119, but after that, there has been a significant reduction. In 2020, 23 dogs underwent spinal X-rays.

With the new reader in place from the fall of 2021 (veterinarian Vibeke Frøkjær Jensen), the number of X-ray examinations started to increase, but there was no significant surge. At the same time, it became evident that the quality of some of the images submitted to the new reader was not adequate, and in several cases, new images were requested.

There have also been cases where the photographing veterinarian did not follow the procedure and took too few images. In such cases, the new reader returned the images. This caused some concern not only among Dachshund owners but also among several veterinarians. Some have stopped X-raying Dachshunds when the purpose is to detect possible calcified intervertebral discs. The information we have received from NKK suggests that fewer images are now being returned, indicating that veterinarians have improved their practices.

Table 9 show IDC degrees of dogs radiographed in 2009–2023 per dachshund breeding population. Number of dogs in each population on the left, percentage of the IDC degree on the right.

	MW+RW	%	W	%	MS+RS	%	S	%	ML+RL	%	L	%	total	%
IDC0	18	27,7	72	42,9	9	18,0	19	24,4	74	37,9	69	35,0	261	34,7
IDC1	30	46,2	55	32,7	16	32,0	33	42,3	67	34,4	81	41,1	215	28,6
IDC2	8	12,3	23	13,7	9	18,0	11	14,1	33	16,9	23	11,7	84	11,2
IDC3	9	13,8	18	10,7	16	32,0	15	19,2	21	10,8	24	12,2	103	13,7
total	65		168		50		78		195		197		753	

Table 9: IDC degrees of dachshunds radiographed in 2009-2023 per dachshund breeding population in Norway.

Table 9 shows that from the start of the program until August 2023, approximately 900 Dachshunds have undergone spinal X-rays. Currently, we do not have statistics showing changes in the number of calcified intervertebral discs, however, we attempt to develop that.

Regarding the number of dogs with disc herniation, it was only in 2022 that we began to gain access to data on this. The diagnosis of disc herniation is not mandatory for reporting in DogWeb. However, work is underway on a new system for registering diagnoses, which may eventually provide us with data on this.

4.3.4 Research activities that have been conducted in Norway.

The reports authored by F. Lingås are broad health examinations based on survey questionnaire including questions regarding IVDD.

Lingås, F. 2019a. Helse- og atferdsundersøkelsen hos korthåret dachs [Health and behaviour survey in short-haired dachshund]. Oslo: NMBU.

Lingås, F. 2019b. Helse- og atferdsundersøkelsen hos langhåret dachs [Health and behaviour survey in long-haired dachshund]. Oslo: NMBU.

Lingås, F. 2019c. Helse- og atferdsundersøkelsen hos strihåret dachs [Health and behaviour survey in wire-haired dachshund]. Oslo: NMBU.

Stigen, Ø. 1991. Calcification of intervertebral discs in the dachshund: a radiographic study of 327 young dogs. *Acta Veterinaria Scandinavica*, 32, 197.

Stigen, Ø. 1996. Calcification of intervertebral discs in the dachshund: a radiographic study of 115 dogs at 1 and 5 years of age. *Acta Veterinaria Scandinavica*, 37, 229.

Stigen, Ø. & Christensen, K. 1993. Calcification of intervertebral discs in the dachshund: an estimation of heritability. *Acta Veterinaria Scandinavica*, 34, 357-361.

Stigen, Ø., Ciasca, T. & Ø., K. 2019. Calcification of extruded intervertebral discs in dachshunds: a radiographic, computed tomographic and histopathological study of 25 cases. *Acta Veterinaria Scandinavica*, 61, 9.

Stigen, Ø. & Kolbjørnsen, Ø. 2007. Calcification of intervertebral discs in the dachshund: a radiographic and histopathologic study of 20 dogs. *Acta Veterinaria Scandinavica*, 49, 1-7.

4.4 Sweden

4.4.1 X-ray screening as mandatory or recommendation action

In Sweden, it is fully voluntary and optional for breeders and dog owners to subject their dachshund to an IDC-screening. The Swedish Dachshund Club finds that the process in Sweden is at an informative state, where knowledge needs to be spread and an increased awareness among breeders and owners is the aim. The breed club also sees the necessity to have as broad acceptance as possible, before stating any recommendations in this matter.

4.4.2 Details of the programme

It has for many years in Sweden, been possible to report dogs affected by IVDD to the Swedish Dachshund Club. The appeal has been directed to breeders or dog owners, to fill in a form with information about age, name, registration number, location of the IVDD, if operation has been performed or if euthanasia had to be chosen. Reported cases of IVDD/Disc prolapse among dachshunds, per 24th September 2024:

Smooth-haired miniature	23
Smooth-haired standard	78
Long-haired miniature	27
Long-haired standard	16
Wire-haired rabbit size	2
Wire-haired miniature	17
Wire-haired standard	180
Total reported cases of IVDD/Disc Prolapse:	343

Table 10: Reported cases of IVDD/Disc prolapse among dachshunds, per 24th September 2024

Agria Breed Profile

The largest animal insurance company in Scandinavia, Agria, has for many years presented statistics over diagnoses in the project Agria Breed Profiles. Data on the diagnose “disc/back pain” among dachshunds is available back to 1995. The trend has steadily been positive, with a declining frequency of these problems in comparison to the nominal average breed. Table 11 shows relative risk for diagnosis “disc/back pain” among dachshunds in Agria Breed Profiles:

1995-2006	2006-2011	2011-2016	2016-2021
4,2	3,9	3,3	2,8

Table 11: The level of higher risk, compared to the nominal average breed.

4.4.3 The effects of the programme

During the time that the official IDC-screening has been available in Sweden (since June 2021), about 130 dachshunds have been x-rayed. See Table 12 on the next page for the numbers for each year.

YEAR	MW+RW	W	MS+RS	S	ML+RL	L	TOTAL
2009	0	1	3	0	0	0	4
2010	3	1	1	0	0	1	6
2011	1	0	0	0	0	0	1
2012	5	2	4	1	2	1	15
2013	6	3	10	1	2	0	22
2014	7	0	2	1	0	1	11
2015	10	5	7	0	3	1	26
2016	10	2	0	1	2	2	17
2017	14	4	4	2	1	4	29
2018	11	2	0	2	1	5	21
2019	14	2	0	2	0	8	26
2020	2	0	1	1	1	8	13
2021	19	6	1	3	1	9	39
2022	15	3	1	3	4	11	37
2023	17	8	6	7	2	17	57
TOTAL	134	39	40	24	19	68	324

Table 12: Number of dogs x-rayed per year per population 2009-2023 in Sweden

The official program for x-raying dachshunds through a requisition from The Swedish Kennel Club, was launched in June 2021. The Table above shows higher activity the last three years. The data for the preceding years all the way back to 2009, are from a private initiative by members who kept statistics on all Swedish dachshunds that were examined in another country (since there was no Swedish system on place). So, the numbers can be seen upon as “older” and “modern”, with a shift in 2021. The Table is of interest as it makes comparisons with the other countries possible and because it is generally agreed that the private collection of data for the years before 2021, was a very thorough and complete coverage of Swedish dogs appearing in either Danish, Finnish or Norwegian data.

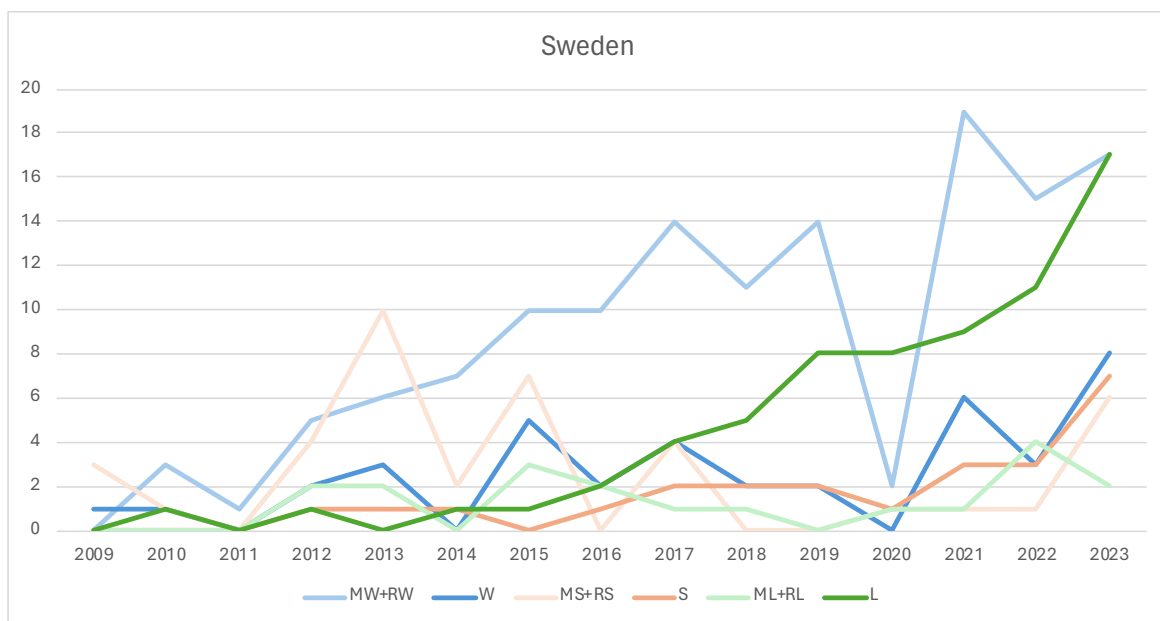


Figure 4: Number of dogs radiographed per year per population 2009-2023 in Sweden

When observing Figure 4 one must remember that Sweden's **official** program came as late as June 2021. Data preceding this date, comes from a private initiative to collect data on Swedish dachshunds screened abroad. We can see that after the launch of the program in 2021, the curves point upward for all varieties, except for the long-haired miniatures and rabbit size. The long-haired standard is the most steadily rising variety and has been actively screening for several years.

	MW+RW	%	W	%	MS+RS	%	S	%	ML+RL	%	L	%	total	%
IDC0	4	14,8	12	28,6	7	14,3	8	25	4	20	35	30,4	70	24,6
IDC1	12	<u>44,5</u>	16	<u>38</u>	13	26,5	7	21,8	<u>6</u>	30	39	<u>33,9</u>	93	<u>32,6</u>
IDC2	2	7,4	5	12	7	14,2	9	<u>28,2</u>	2	10	25	21,8	50	17,5
IDC3	9	33,3	9	21,4	22	<u>45</u>	8	25	8	<u>40</u>	16	13,9	72	25,2
total	27		42		49		32		20		11 5		285	

Table 13: IDC degrees of dachshunds radiographed in 2009-2023 per dachshund breeding population in Sweden.

From Table 13 we can see that well over 55% of the screened dachshunds in Sweden, have had IDC0 or IDC1 as result. The result - higher than our Nordic neighbours - of around 25% for dogs with severe levels of calcification (IDC3) must perhaps be understood against the background that Sweden has only recently started selecting stud animals with this method. With time, the hereditary aspect will most probably reflect in a lower number.

5. Future plans

This chapter provides information on new developments in the prevention of IVDD.

5.1 Denmark

We await the results of DNA testing in Norway and Finland. Continuous blood samples are taken for future testing and research. ***Include DKK registration of gene testing

The Danish Minister of Food announced in January 2024 that animal welfare must be strengthened, and the largest animal welfare organization is currently running a campaign that DKK supports. We follow this work and anticipate that there may be initiatives that affect us.

[https://fvm.dk/Media/638465241338033175/SAMMEN_OM_DYRENE -
23 initiativer der skal styrke dyrevelfaerden i Danmark1.pdf](https://fvm.dk/Media/638465241338033175/SAMMEN_OM_DYRENE_-_23_initiativer_der_skal_styrke_dyrevelfaerden_i_Danmark1.pdf)
<https://www.dyrenesbeskyttelse.dk/sund-avl>

5.2 Finland

In Finland, a new law of animal welfare has come into effect in 2024. Its regulations will not be implemented at the same time because they are not yet ready. However, it is likely that the legislation will require significantly stronger focus on improving spinal health. Mandatory screening for breeding dogs is coming in the beginning of 2025. Due to significant variation in screening activity and results among different dachshund populations, FDC has proposed a gradual tightening of requirements in their spinal health strategy (attached). Whether this proposed strategy will be accepted by authorities is still unknown.

In addition to the radiographic way of fighting the IVDD problem we have also started the genetic way. FDC has negotiated a discounted price with Laboklin laboratory for IVDD, PRA, and OI genetic tests for its members. The results will be stored in MäykkyNet and/or KoiraNet databases, making information about dogs with normal genes accessible to everyone. Dogs with normal allele have been found among all standard-sized dachshunds and long-haired miniature dachshunds. Additionally, all spinal imaging results can be found on MäykkyNet, also those older ones which are not visible in KoiraNet.

Table 14 shows the number of CDDY-tested dachshunds in Finland and dogs with normal allele (saved in MäykkyNet 24th April 2024):

Year	MW+ RW			W			MS+ RS			S			ML+ RL			L			total tested	N/CDDY	N/N
	tested	N/CDDY	N/N	tested	N/CDDY	N/N	tested	N/CDDY	N/N	tested	N/CDDY	N/N	tested	N/CDDY	N/N	tested	N/CDDY	N/N			
2023	32	0	0	115	28	2	14	0	0	95	20	3	44	6	0	48	8	0	348	62	5
2024	3	0	0	73	30	5	12	0	0	38	10	0	63	23	4	34	5	0	223	68	9

Table 14: Number of CDDY tested dachshunds in Finland and dogs with normal allele (saved in MäykkyNet 24th April 2024)

Table 14 show that the biggest amount of the tested dogs has been wire-haired standards and smooth-haired standards. Dogs with the normal allele have been found in all standard populations and in the long-haired miniatures. There are no dogs with normal gene in the miniature wires and miniature smooths so far.

Because of the large number of IDC grade 3 dogs especially in miniature smooths and miniature wires, we still need also other tools than x-raying and gene testing our dogs in order to breed dachshunds with better back health. That's why we are planning to start an open health database on MäykkyNet that can be accessed by anyone. Owners are encouraged to continue submitting health reports for their affected dogs. In the future, this information will be added to the open health database on MäykkyNet.

5.3 Norway

The period from May 2022 to the present (April 2024)

The meeting for the leaders of the local dachshund clubs (KL) on 23rd April 2022, and decisions at the Dachshund Congress (the annual general assembly) on 24th April 2022

The club leaders took the initiative to address the issue of continuing the spine program in the meeting and made the following unanimous statement:

KL recommends that HS (the board) focus extra on spinal X-rays, in the period 2022-2025, for all dogs aged 2-4 years. We recommend a significant increase in the proportion covered by spinal X-rays, and that there be a common financial solution for all clubs. This should be funded from our accumulated funds, and KL recommends a maximum participant fee of 1000 NOK.

An action plan, in collaboration with the clubs, should be created for informing puppy buyers to demand spine X-rays from breeders.

Based on the data collected during this period, SU (the health committee) must draw a conclusion and present it for the further development of the breed. SU is requested to use existing data as a factual basis.

Considering this, a proposal was made to allocate an additional € 12.840 in addition to the € 2.568 proposed for the spine program.

In connection with the proposal, it was also commented that:

Data from previous years' X-ray examinations are used as factual basis. The material is edited/structured in a way that the results can be displayed for the different breeds where there is enough data.

Budget deficit in 2022: Due to two years of COVID-19, where NDF (Norwegian Dachshund Federation) has had significantly fewer expenses for various types of meetings, it is therefore reasonable to budget for a deficit in 2022 and use a part of our equity.

The Dachshund Congress held the following day made the necessary budget decisions to ensure financial support so that more people choose to X-ray their Dachshunds.

NDF's Breeding Recommendations

NDF's breeding criteria and recommendations were updated on 16th May 2022. It is recommended that both parents should have a known spinal status, and the X-rays should be taken at the age of 2-4 years. The decision to make spinal X-rays a recommendation rather than a requirement is a politically influenced decision. We have both large and small breeders and individual members express a certain degree of scepticism to spinal X-rays as a method; consequently, they do not X-ray. Several strong voices argue that if spinal X-rays become a requirement for breeding animals, they will stop breeding or only breed family dogs that are not registered. Due to the disagreement, we have therefore considered that X-ray as a requirement is likely to have unintended consequences, and we are likely to recruit better if we keep it as a recommendation.

We can see from the statistics that we have a good increase in the number of X-rayed dogs, although there is still a long way to go before we have a sufficient index. But we also see several examples of breeders who previously did not X-ray, starting to do so.

Action Plan - Follow-up of the Club Leaders' Statement

An action plan for the promotion of spinal X-ray of dachshund was developed with the following aim:

The aim of NDF's action plan will be to contribute to achieving the objectives and priorities related to the spinal health of the Dachshund in the Breed-Specific Breeding Strategy (RAS).

Topics in the plan:

- Information for breeders, dog owners, and puppy buyers about the importance of spinal X-rays
- Knowledge development
- Measures on social media and in the member magazine
- Knowledge webinars
- Financial support for members who X-ray their dachshunds
- Collaboration with external actors such as Pyramidion and Aninova
- Nordic cooperation
- Gene testing

One of the goals in RAS (and therefore in the action plan) is to X-ray enough dogs to develop an index. The number of dogs X-rayed since the start and until 23rd July 2023, is 990 dogs. In the winter of 2023, an index was developed. With so few X-rayed individuals, the reliability figure is so low that the index cannot be used. To achieve the goal of an index in 2023, about 300 more dogs need to be X-rayed.

Financial Support for Conducting Spinal X-rays

Regarding financial support, NDF provides its members with a subsidy of 50% of the cost for spinal X-rays at a veterinarian, limited to 2,000 NOK. The dog owner's co-payment is set at 1,000 NOK. The condition is that the dog is within the correct age range (2-4 years), and a referral must be ordered through NKK (Norwegian Kennel Club) before the X-ray examination. Only readings done by NKK's reader are valid and can be registered in Dogweb.

Evaluation of the Action Plan

The action plan was reviewed at the club leaders' meeting in 2023, and there was agreement to continue following it. The Dachshund Congress also approved the necessary budget framework for financial support for members who X-ray their dogs in 2023.

The Genetic Route

In June 2023, we received a proposal from one of NKK's veterinarians for a new project with a preliminary title, "Proposal for DNA-based measures for improved spine health in Dachshunds." The proposal is based on exploiting the fact that in the Nordic Dachshund population, especially among wire-haired Dachshunds, there is an occurrence of the normal/wild-type gene variant (N) of FGF4 on chromosome 12, as opposed to the retrogene (CDDY).

If a coat type variant has a higher proportion of N/N and N/CDDY, it is possible to gradually spread the normal gene variant through coat type crosses, and thus, in the long run, reduce CDDY and thereby reduce the occurrence of disc herniation. It is emphasized while it will still be necessary to continue X-raying and use the results in breeding.

We are currently working on the project outline aiming for launching it shortly. There is a possible goal to quickly map the occurrence of N/N, N/CDDY, and CDDY/CDDY in the different varieties of the Norwegian population. The proposer points out the advantages of Nordic cooperation, which we are positive about.

Table 15 shows the number of CDDY-tested dachshunds in Norway and dogs with normal alleles (registered in Dogweb 30th April 2024).

Year	MW+ RW			W			MS+ RS			S			ML+ RL			L			total tested	N/CDDY	N/N
	tested	N/CDDY	N/N	tested	N/CDDY	N/N	tested	N/CDDY	N/N	tested	N/CDDY	N/N	tested	N/CDDY	N/N	tested	N/CDDY	N/N			
2023	5	0	0	8	0	0	14	0	0	7	0	0	36	3	0	30	4	0	100	7	0
2024	17	0	0	91	25	0	11	0	0	65	25	2	110	7	0	85	11	0	456	68	2

Table 15: Number of CDDY-tested dachshunds in Norway and dogs with normal allele (saved in Dogweb 2024)

In Table 15, we find that 14% of the dachshunds tested in Norway have a normal allele. The number of tested dogs mainly reflects the registration numbers, except standard wire, which is

the largest in registration numbers. So far there are no miniature/rabbit smooth- or wirehair with the normal allele.

Breeding recommendations for N/CDDY and N/N dachshunds, made by NKK and NDF

The prevalence of the normal gene is presumed to be low in the population. Breeding to preserve the normal gene should aim for a wide spread of the gene within the different bloodlines without limiting the genetic variation in the breed. Breeding to preserve the normal gene should aim for the use of as many related N/CDDY dogs as possible with no or few common bloodlines with their partners.

- 1. N/CDDY mated to CDDY/CDDY. The offspring is tested and N/CDDY puppies are used for further breeding. All N/CDDY male puppy buyers should receive information about the importance of them being available for stud. N/CDDY female puppies should be sold with plans for breeding, at least one litter.*
- 2. N/CDDY can be mated with N/CDDY, but this should be planned in cooperation with the breed club's health committee to ensure that the spreading of the normal gene will benefit the breed as a whole. Offspring is tested and any N/N puppies should be involved in future plans for breeding with CDDY/CDDY dogs from unrelated bloodlines in the following generations.*
- 3. N/CDDY and CDDY/CDDY should not have more than one litter with the same partner. This to ensure the spread of the normal gene in the population and avoid inbreeding issues in the following generations.*
- 4. Crossbreeding between sizes – It is a good idea to crossbreed with sizes to achieve more unrelated bloodlines that are N/CDDY. When crossbreeding miniature with standard the smaller N/CDDY puppies should continue in miniature breeding and the larger in standard breeding.*
- 5. Crossbreeding between coats – It is a good idea to crossbreed with coat varieties to achieve the presence of the normal gene in all varieties, and at the same time ensure genetic variation within each variety. Smooth haired dachshunds can be crossbred to wire- or long-haired dachshunds, wire haired dachshunds cannot be crossbred to long haired dachshunds. In litters from crossbreeding, the N/CDDY puppies should contribute to the breeding of the variety where they belong according to their coat. For crossbreeding between smooth and long-haired dogs it could take two generations to get long-haired puppies if the smooth haired does not carry the gene for longhair.*

The goal is to gradually increase the prevalence of the normal gene in the varieties of the breed. While doing this the breeding from CDDY/CDDY dogs HAS to continue. If there is too much focus on breeding for the normal gene the genetic variation within the breed will decrease, which will be very unfortunate for the breed in the future, and could result in other challenges like inbreeding depression, increase of diseases and more.

If there are several puppies from the same litter, which all are N/CDDY, it is a goal to use them all in breeding rather than one being used excessively. All breeding on N/CDDY dogs should aim for N/CDDY puppies being used in further breeding. To achieve this all litters where one parent is N/CDDY, should be tested before it is decided who their new owners will be, and that the result of the test should influence which puppy goes where with future use in breeding in mind.

To gradually increase the prevalence of the normal gene in the dachshund breed should N/CDDY and N/N dogs on average have more offspring than CDDY/CDDY dogs. It is very important to keep in mind that males do not sire too many offspring. It is particularly important to avoid excessive use of males at a young age.

5.4 Sweden

The x-ray route

Looking ahead an important goal is to further spread information about the x-raying possibility. An increase in x-rayed dogs, will be of benefit for all as the statistic material steadily will become larger. The Swedish Dachshund Club does not at the moment support dog owners financially with the x-raying costs. But this topic must be returned to and evaluated anew as time goes and the programme develops.

The genetic route

We notice a big interest among dog owners, regarding the gene test for “the wild gene”. As it turns, the Swedish Kennel Club cannot at this time, present results of the FGF4-12 test in Hunddata.

The question of a proper Swedish registration of the gene test FGF4-12, is however very much a priority for the Swedish Dachshund Club and during the autumn and winter of 2024-2025 the matter will be discussed further with The Swedish Kennel Club, with the ambition that the national kennel club will start registering test results. In October of 2024, as a solution for the time being, The Swedish Dachshund Club decided to launch the offering of tests to dog owners and to start a register of dachshunds tested in Sweden.

The reporting route

The reporting route will be kept, as it gives highly interesting information. Actually, not only regarding IVDD, even if this is the most serious health problem to be handled.

Increased age for debut as breeding dogs

For almost two decades The Swedish Dachshund Club has recommended that dogs and bitches make their debut in breeding, at the age of 3 years. This will then lead to grandparents being at least 6 years when a litter is planned. At this age many dogs that are affected with back problems, will have shown symptoms and the breeder can then make an aware and informed decision whether to breed or not on individuals that have affected relatives.

Any other business

Of highest importance and influence, is of course the interest we see from authorities and animal welfare organisations, regarding the breeding of household pets, the competition with animals and the general wellbeing of all animals kept by humans. The difficult but very important task is, if possible, to be a step ahead in these matters, is on our table.

6. X-ray: Mandatory or not mandatory?

Many years ago, it could be debated whether the spinal problem in dachshunds even existed. Likewise, some believed that while the spinal problem existed, it was inherent to the breed, and nothing could be done about it. Today, people are more educated and informed, and attitudes towards animal welfare as our responsibility have fortunately evolved. As a result, such viewpoints are rarely advocated anymore.

The common starting point is thus the knowledge that our breed has a spinal problem and the attitude that it is our obligation to address this issue. What we need to determine is how we can best reduce the number of dogs affected by IVDD. Our primary tool is the spinal examination. How can it be used most effectively? Voluntary participation – or is a breeding restriction necessary? Below, we have attempted to list arguments for both approaches.

Arguments for X ray screening not to be mandatory:

- Consideration for the dogs. Dogs may experience discomfort associated with a spinal examination.
- Consideration for puppy buyers. Puppy buyers avoid receiving information about any poor spinal results in the parents and thereby avoid the concern that this knowledge might cause.
- Consideration for the breeders. The breeder saves money on examination expenses and avoids having to remove dogs with poor results from breeding, as well as avoiding feeling forced to do something they don't like to do. In the worst case, the breeder avoids feeling compelled to leave organized breeding.
- Consideration for genetic variation. If breeders who do not wish to have their dogs examined leave organized breeding, it could reduce the number of dogs available to breeding within our pedigree dog community, which could have a negative effect on genetic variation.
- Consideration for kennel and breed clubs. It would be negative for kennel and breed clubs if a larger number of breeders leave the clubs and organized breeding.
- Consideration for the reputation of the breed and the club. It would be negative for the reputation of the breed and the club if it is outwardly displayed that there is internal division and disagreement about wanting to better the health of our breed.

Arguments for X ray screening being mandatory:

Consideration for the dogs. It is difficult to justify not doing everything we can to avoid producing puppies at high risk of developing IVDD.

- Consideration for puppy buyers. It is difficult to explain to a puppy buyer that they were simply unlucky to purchase a puppy from unexamined parents or parents with poor spinal status.
- Consideration for the breeders. It is difficult and feels unfair for breeders who utilize spinal examinations to have the expense of the examination and the responsibility of removing dogs with poor spinal status from breeding, while their breeder colleagues do not have the same expenses and issues. Unequal requirements and conditions risk creating discord and negative discussion among breeders.
- Consideration for the genetic variation. It is difficult to avoid the emergence of breeding in two separate subpopulations – one population for dogs that have undergone spinal examination and one population for dogs that have not. This is not

desirable. The best approach is for all of us to work together and utilize as many different, good dogs as possible in breeding.

- Consideration for kennel and breed clubs. It is difficult for clubs to promote puppies from dogs that have undergone spinal examination while simultaneously explaining to our surroundings and puppy buyers that we also include those who do not use spinal examination or who breed dogs with poor spinal status.
- Consideration for the reputation of the breed and the club. We need to show our surroundings that we take the breed's problem with IVDD seriously. It is difficult to explain and defend to our surroundings why we do not use a tool suitable for reducing the frequency of dogs affected by IVDD.

7. Making data publicly available

The results from both x-ray screening and gene testing must be publicly available both for breeders in order to select breeding dogs, for puppy buyers who want to check for example the health status of parent dogs. Data should also be easily available to researchers and the public in general. Making data publicly available is one tool to ensure openness in dog breeding.

In all the four Nordic countries, the national kennel clubs offer websites with extensive and easily accessible information on all registered dogs.

Denmark www.hundeweb.dk

Finland www.jalostus.kennelliitto.fi

Norway www.dogweb.no

Sweden www.hunddata.se and www.avelldata.se

On these sites one can find results from dog shows, hunting tests and mental tests. But also, health information from for instance eye screenings, patella test results and IVDD screenings. The sites are open for everyone to access. However, Denmark's Hundeweb requires a membership to log in. An important and very useful tool is the possibility to make "test matings" between two individuals to see in advance what the inbreeding percentage will be in a litter.

The site that is probably the most developed and user friendly at this stage, is Finland's. So let us use them as an example. More information on how to navigate this site:

The Finnish Kennel Club's database can be found on www.jalostus.kennelliitto.fi. It works in Finnish, Swedish and English. To view information about one breed, first select the FCI group in the drop-down menu, then the breed in the second drop-down menu. You can search dogs by name or registration number. On a dog's page you can find all its health, trial and show results, pedigree, list of siblings and possible offspring.

To search the results of a whole breed you can use the buttons in top centre: Latest Litters, Trials, Results, Shows, Health, Champions, Imports. To find the spine x-ray results during 2023 for example, you must select first year 2023 and then click all the other boxes except spine. CDDY gene test results can only be found here.

Another way to search is advanced search. First you must go to Breed related settings and click those health results you want to search. Only hips, knees, spine, heart, and eye results can be searched at advanced level.

The sites of the other countries offer pretty much the same information and are as easy to navigate once you start trying. But they are not offered in English, which is a great advantage with the Finnish site, of course.

8. How can we see results from our efforts?

When can we expect to see results from our efforts?

The x-ray route

In Denmark, a study was conducted in 2001 to investigate the frequency of intervertebral disc disease (IVDD) among wire-haired dachshunds born in 1991. At the time of the study, the dogs were 10 years old. Questionnaires were sent to a sample of 250 owners, with a response rate of 72%. The proportion of dogs diagnosed with IVDD during their lifetime was 15.7%. Additionally, 4.6% of the dogs had shown symptoms of the disease, but it had not been diagnosed by a veterinarian. This gives a total occurrence of 20.3% (Nilsson, 2001).

It would be beneficial if a similar study could be conducted again. If such a study is conducted in, for example, 2026, it would include dogs born in 2016. In 2016, 196 wire-haired standard dachshund puppies were registered in Denmark. Of these, 96 (49%) had parents that were both screened, and the screened parents had an average of 1.35 calcifications. Therefore, a lower frequency would be expected compared to the dogs from 1991.

Due to for example the current GDPR regulations, it could be challenging for the clubs themselves to conduct such a study. We will be dependent on interest from researchers. It would be desirable if we could find additional ways to monitor our efforts, for example ongoing monitoring using, geometric index or other measures.

The genetic route

The genetic testing is still in its early days. Predictions of what to expect will be based on some assumptions that might turn out differently as the project continues. However, according to the numbers in Norway this far it is possible to attempt to give an example of how the conservation and desired increase in prevalence of the gene might develop.

The basis for this prognosis is based solely on the Norwegian dachshund population, at the current time (April 2024) the prevalence of the normal gene is about 15% in all dachshund varieties. According to NKK's geneticist this would result in about 30% of all registered litters the following year having at least one parent that carries the N-gene.

If we assume that breeders follow the breeding recommendations given by NKK and NDF we can assume that an average of two puppies carrying the N-gene will be used for breeding, doing the math for exponential growth (188 litters in 2024) that would mean 13,8% increase when the next generation is of age about two years later. Following that thought it could be possible to come close to 100% of all litters having at least one parent carrying the N-gene about 10 years later. Any addition of the N-gene from foreign dogs would speed up the progress.

This is of course a mathematical calculation, not taking into consideration all the decisions breeders have to make when they select dogs for breeding. It does not take into consideration that some varieties have a significantly higher prevalence of the N-gene already. Neither does it add any new imports with the N-gene making a difference.

The breeding recommendations advise that as many N-gene carriers as possible should be available for further breeding, and that breeders should be very aware of the need to keep the genetic variation as diverse as possible.

A guideline suggested by NKK geneticist:

A dachshund carrying the N-gene which is used for breeding once should not be used again with the first partner's, parents, siblings, half-siblings or offspring.

The need to cross breed between different varieties is also a factor that might make some varieties increase the prevalence of the gene more or less rapidly than others. At the current time both miniature- and rabbit size smooth and wire will have the challenge of finding ways to get N-gene carriers in their varieties. For smooth miniatures and rabbits, it would be possible to cross breed with standard smooth and long-haired miniature/rabbit. For wire miniatures and rabbits, the option would be standard wire or standard smooth at this point, considering the lack of dogs carrying the N-gene in miniature and rabbit smooth. Considering the wire coat and the number of standard wires carrying the N-gene, standard wire cross breeding might be the solution that could give the desired breed coat as well as the N-gene.

Making this kind of mathematical prediction is not in any way to be considered a conclusion of how the development will be. This is an explanation of how it could work statistically, so that we have an idea of the time frame we might look at. The prediction only calculates for litters with one parent carrying the N-gene, it is to be expected that there will also be litters with both parents carrying the N-gene. The following generations after 2024 will provide more accurate data for more a more accurate prediction.

9. Summary and Conclusion

Both spinal X-rays and genetic testing for dachshunds are research-based measures aimed at preventing disc herniation. Spinal X-rays began as a pioneering effort in the early 2000s. Today, all Nordic countries, as well as the United Kingdom, recommend and offer spinal X-rays for dachshunds. Genetic testing, as practiced in Norway and Finland, is rooted in research conducted at the University of California in the USA.

There are many good reasons to perform spinal X-rays. On an individual level, it provides knowledge about whether a dog has an increased or reduced risk of developing disc herniation during its lifetime. Breeders can use the results of spinal X-rays as one of several important factors in selecting breeding animals. High participation in the spinal X-ray program and proper use of the results will contribute to better spinal health in dachshunds. An important goal of spinal X-rays is to achieve sufficient participation in the program so that an index can be developed to aid in breeding. Denmark has achieved this goal.

There are also good reasons to conduct genetic testing to identify the normal gene. By breeding dachshunds with the normal gene, the gene will spread throughout the breed, helping to reduce the incidence of disc herniation.

Changing heritable traits in a population can take a very long time. It is work that requires strong support, endurance, and patience from all involved parties. Therefore, it is crucial that dachshund clubs take responsibility for implementing the programs. Successful dissemination of information is also essential. This document shows, among other things, that there is a lot of research on various aspects of disc herniation in dachshunds and the use of spinal X-rays. The challenge lies in making enough information available in a way that reaches all dachshund owners. This is an exceptionally large task that should not be underestimated. It is also undeniable that financial support schemes help increase the number of dogs undergoing spinal X-rays.

It has sometimes been a challenge to maintain transparency regarding the results of spinal X-rays. All officially interpreted spinal X-ray images are published for each dog in the country's kennel club's data systems. Some breeders fear that a high number of calcified intervertebral discs is bad publicity, while others fear they should no longer use a particular dog for breeding. The biggest challenge in such a situation is the lack of transparency in breeding work. It is precisely through transparency that good choices can be made, promoting a healthy breed. Breeding should be conducted for the benefit of the breed as a whole, not based on individual breeders' self-interests.

We have not seen the same challenges related to transparency regarding genetic testing. The results are also published not only for each dog but also on specific lists.

We hope that this document can be enlightening not only for our Nordic readers but also for dachshund owners and their organizations in other countries. We are very interested in receiving information about how other countries assess disc herniation in dachshunds and what measures are being taken. By exchanging information between countries on specific topics, we can learn from each other and establish good collaborations that can benefit the breed.

Literature list

- Andersen, A. 1995. *Discusprolaps hos gravhund. Årsagsforhold, heritabilitet, diagnose.* [Disc herniation in dachshund. Causes, heritability, diagnosis.]. Hovedoppgave [Masters Degree Dissertation].
- Andersen, C. M. & Marx, T. 2014. *Diskusprolaps hos gravhunde. Incidens studie og follow-up studie på rygfotografering og brugen af K-status og indekstal.* Kandidat i veterinærmedicin Speciale, Københavns universitet.
- Ball, M. U., Mcguire, J. A., Swaim, S. F. & Hoerlein, B. F. 1982. Patterns of occurrence of disk disease among registered dachshunds. *Journal of the American Veterinary Medical Association* 180, 23.
- Beck, S. 2006. *Disk-degenerasjon hos gravhund - et klinisk, radiologisk follow-up studie.* [Disc-degeneration in Dachshund, a clinical, radiological follow-up Study.]. Veterinært speciale. .
- Bergknut, N., Egenvall, A., Hagman, R., Gustås, P., Hazewinkel, H. A., Meij, B. P. & Lagerstedt, A.-S. 2012. Incidence of intervertebral disk degeneration-related diseases and associated mortality rates in dogs. *Journal of the American Veterinary Medical Association*, 240, 1300-1309.
- Dachshund Health Uk 2024. An analysis of results of the UK Dachshund IVDD Screening Programme. London.
- Hansen, H.-J. 1952. A pathologic-anatomical study on disc degeneration in dog: With special reference to the so-called enchondrosis intervertebralis. *Acta Orthopaedica Scandinavica*, 23, 1-130.
- Havráněk-Balzaretti, B. 1980. *Beitrag zur Aetiologie der Dackellähme und Vorschlag zur Züchterischen Selektion.* . Inaugural Dissertation. , University of Zürich.
- Jensen, V. F. 2001. Asymptomatic radiographic disappearance of calcified intervertebral disc material in the Dachshund. *Vet Radiol Ultrasound*, 42, 141-8.
- Jensen, V. F. & Arnbjerg, J. 2001. Development of intervertebral disk calcification in the dachshund: a prospective longitudinal radiographic study. *J Am Anim Hosp Assoc*, 37, 274-82.
- Jensen, V. F., Beck, S., Christensen, K. A. & Arnbjerg, J. 2008. Quantification of the association between intervertebral disk calcification and disk herniation in Dachshunds. *Journal of the American Veterinary Medical Association*, 233, 7.
- Jensen, V. F. & Christensen, K. A. 2000. Inheritance of Disc Calcification in the Dachshund. *Journal of Veterinary Medicine Series A*, 47, 331-340.
- Jensen, V. F. & Ersbøll, A. K. 2000. Mechanical factors affecting the occurrence of intervertebral disc calcification in the dachshund--a population study. *J Vet Med A Physiol Pathol Clin Med*, 47, 283-96.
- Lappalainen, A. K., Mäki, K. & Laitinen-Vpaavuori, O. 2015. Estimate of heritability and genetic trend of intervertebral disc calcification in Dachshunds in Finland. *Acta Veterinaria Scandinavica*, 57, 6.
- Lappalainen, A. K., Vaittinen, E., Junnila, J. & Laitinen-Vpaavuori, O. 2014. Intervertebral disc disease in Dachshunds radiographically screened for intervertebral disc calcifications. *Acta Veterinaria Scandinavica*, 56, 7.
- Nilsson, N. S. 2001. *Diskusprolaps hos gravhund - en populasjonsundersøgelse.* Kandidat i veterinærmedicin Speciale, Den Kgl. Veterinær- og Landbohøjskole.
- Packer, R., Seath, I., O'Neill, D., De Decker, S. & Volk, H. 2016. DachsLife 2015: an investigation of lifestyle associations with the risk of intervertebral disc disease in Dachshunds. *Canine genetics and epidemiology*, 3, 1-15.

- Priester, W. A. 1976. Canine intervertebral disc disease—occurrence by age, breed, and sex among 8,117 cases. *Theriogenology*, 6, 293-303.
- Stigen, Ø. 1991. Calcification of intervertebral discs in the dachshund: a radiographic study of 327 young dogs. *Acta Veterinaria Scandinavica*, 32, 197.
- Stigen, Ø. & Christensen, K. 1993. Calcification of intervertebral discs in the dachshund: an estimation of heritability. *Acta Veterinaria Scandinavica*, 34, 357-361.

Appendix 1: Lawsuit against the NKK, the Norwegian Cavalier Club and the Norwegian Bulldog Club

Breeding of the Cavalier dog breed is in violation of the Animal Welfare Act, while breeding of English Bulldogs is possible under a specific breeding program.

Supreme Court judgment of October 10, 2023, HR-2023-1901-A, (case no. 23-004643SIV-HRET), civil case, appeal against judgment.

I. Norwegian Kennel Club, Norwegian Cavalier Club, A, B, C (lawyer Anette Fjeld) against the Norwegian Animal Protection (lawyer Emanuel Feinberg)

II. Norwegian Animal Protection (lawyer Emanuel Feinberg) against the Norwegian Kennel Club, Norwegian Bulldog Club, D, E, F (lawyer Anette Fjeld)

The Norwegian Animal Protection sued the Norwegian Kennel Club, Norwegian Cavalier Club, Norwegian Bulldog Club, and six breeders because it believes that continued breeding of the dog breeds Cavalier King Charles Spaniel and English Bulldog is in violation of § 25 of the Animal Welfare Act. The reason is that these dog breeds are particularly prone to disease, partly due to targeted breeding for specific physical traits.

The Supreme Court has ruled that continued breeding of Cavaliers is in violation of the law, while breeding of English Bulldogs under a specific breeding program will be lawful. The Supreme Court confirms that the courts can impose a ban on breeding certain breeds under § 25 of the Animal Welfare Act and that the Norwegian Animal Protection had the right to bring such a lawsuit.

Under § 25 of the Animal Welfare Act, breeding that negatively affects the functions of animals or reduces the possibility of natural behaviour is prohibited. A holistic assessment based on knowledge of breeding and genetics shall be conducted, where the type of stress or disease for the animals, the cause of the condition, and the purpose of the breeding are central. One threshold cannot cover all breeding situations. The threshold for production animals will generally be higher than for pets.

Almost all dogs of the Cavalier breed have specific neurological conditions because the skull is too small for the brain, leaving insufficient space for the nervous system. These conditions can lead to the disorders Chiari-like malformation pain (CM-P) and symptomatic syringomyelia (SM-S), causing pain to the dogs. When at least 15 percent of the dogs develop these disorders, further breeding of the Cavalier breed, as it stands today, will be in violation of § 25 of the Animal Welfare Act. There is no evidence of significant improvement in the short term through specific breeding programs.

Regarding English Bulldogs, the Supreme Court states that the condition Brachycephalic Obstructive Airway Syndrome (BOAS) in grades 2 and 3 is so severe that when a significant proportion of the dogs are affected, continued breeding will generally be in violation of § 25 of the Animal Welfare Act. BOAS is a syndrome that causes breathing difficulties for the

dogs and is partly associated with the compressed snout. Because a breeding program initiated by the kennel club has shown promising results in reducing severe BOAS, continued breeding following this breeding program will not be in violation of the law.

The judgment was pronounced by dissent. Two judges have a different view on the threshold and believe that it has not been exceeded for Cavaliers either.

The judgment provides guidance for the understanding of § 25 of the Animal Welfare Act. [Read the full decision from the Supreme Court \(HR-2023-1901-A\)](#). [in Norwegian language only]

Legal Area: Animal Welfare Act § 25. Civil Procedure.

Key Paragraphs: 122, 146, 176

Judges: Bull, Bergh, Østensen Berglund, Thyness, Hellerslia

Source: The Norwegian Supreme Court

(<https://www.domstol.no/no/hoyesterett/avgjoreler/2023/hoyesterett-sivil/HR-2023-1901-A/>)

Appendix 2 Flow Chart Diagram – Danish Breeding Requirements

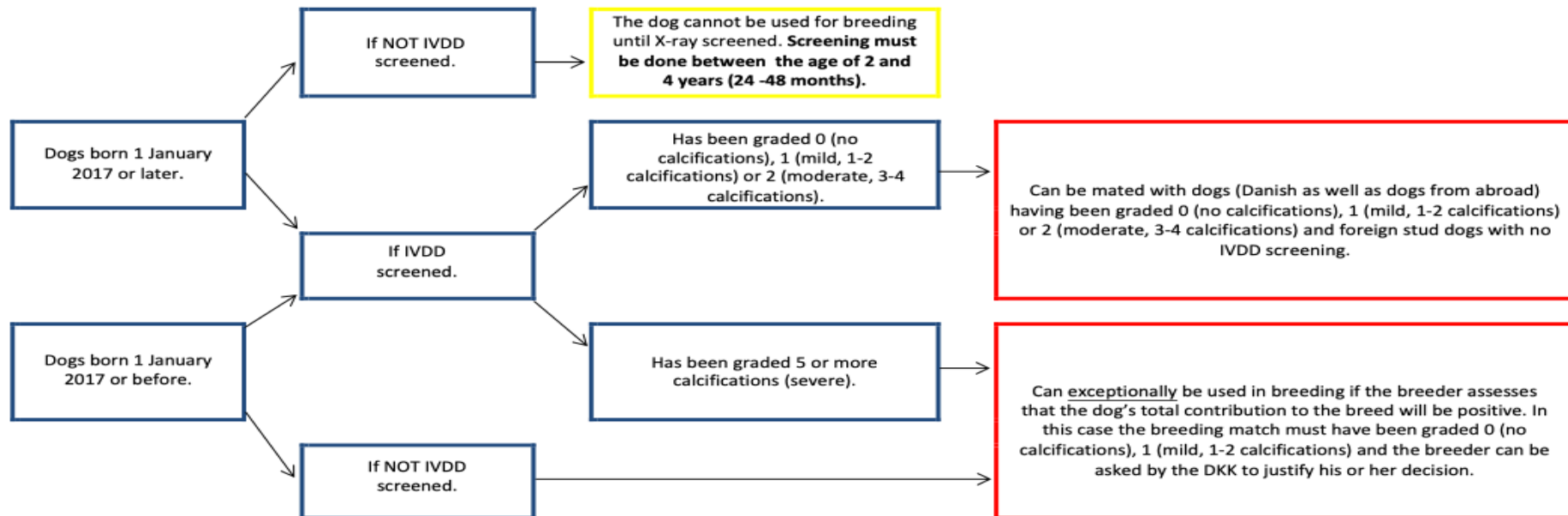
FLOW CHART in effect from 1 January 2023

Which dog can I use as a match?

The breeding requirements comprise all Danish owned dogs as well as foreign owned breeding dogs in Denmark with a Declaration of disposal.

In order to be given a Basis Plus pedigree, in addition to the below mentioned breeding restrictions, the following must be respected:

1. Both parents have no calcifications (grade 0) or 1-2 calcifications (mild, grade 1) registered at the DKK or the average of the spine index from both parents is ≥ 100 at the time of breeding.
Further requirements for wire-haired dachshund:
2. At least one of the parents is registered genetically free from crd PRA at the DKK.
3. At least one of the parents is registered genetically free from OI (Osteogenesis Imperfecta) at the DKK.



Basis pedigrees (Basis registration papers) are given to offspring when both parents apply to the breeding restrictions.

Basis Plus pedigrees (Basis Plus registration papers) are given to offspring from parents which apart from applying to the breeding restrictions also apply to the breeding recommendations.

A Basis Plus pedigree (Basis Plus registration papers) will be endorsed: **This dog is bred according to the recommendations from DGK (The Danish Dachshund Club) and DKK (The Danish Kennel Club).**

Exceptionally is to be understood in such a way that the parent dog with 5 or more calcifications is to be kept in mating quarantine until half of the litter has been screened for IVDD with a reasonable result.

At the present the DKK registers screening results from Norway, Sweden, Finland and England. Foreign stud dogs with a registered screening at the DKK are subject to the same breeding requirements as Danish dogs. If a foreign owned stud dog is screened in Denmark and the result is registered at the DKK, he can be used on the same terms as a Danish owned stud dog.

2024-04-14