

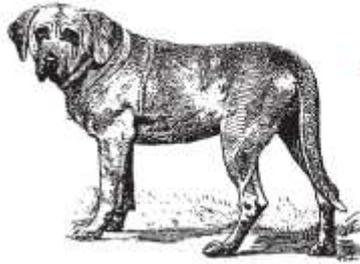
Broholmerselskabet

Specialklub for Broholmerracen

RAS – Breed specific breeding strategy for the Broholmer breed



ISSUED 2018/2019

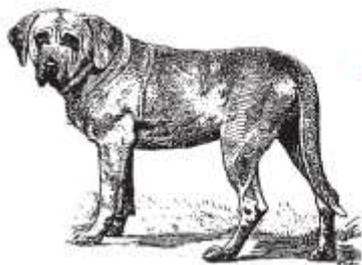


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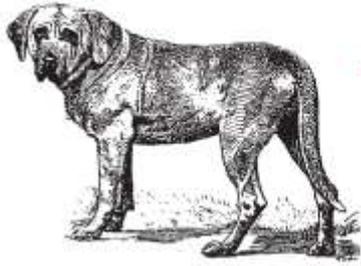


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PROLOGUE

This RAS has been written by the Breeding Committee and representatives from the Board in the period August 2018 - March 2019.

During this process, we have received valuable assistance and exchange of ideas from several parties, and we would thus like to thank the following:

Helle Friis Proschowsky, Veterinarian and Ph. D in Molecular Genetics for valuable exchange of ideas and several readings of the sections regarding health and population.

Jørgen Koch, Professor MSO at KU, for reading and exchanging ideas regarding Project "Broholmer Heart".

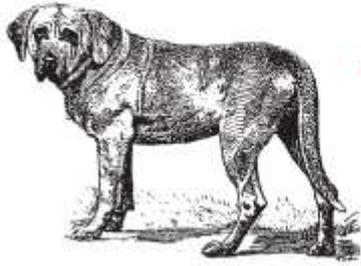
Bo Lasthein Andersen, Chairman of the DKK committee for "Nationale og Glemte racer" (National and Forgotten Breeds) for exchange of ideas regarding the section of exterior as well as for reading the entire document.

We trust that this RAS will be well received by all parties.

Sincerely,

The Breeding Committee & The Board of Broholmerselskabet





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INTRODUCTION

Broholmerselskabet, a breed club under DKK (Danish Kennel Club) is working together with the DKK in order to keep and secure the future for the Broholmer – one out of five Danish national breeds.

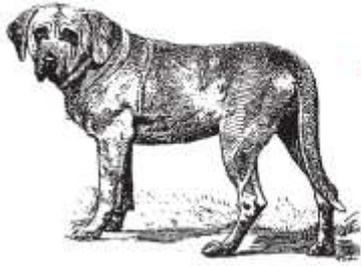
Since the Broholmer until recently was being considered as a reconstruction breed, it is rooted in the DKK with the “Committee for National and Forgotten Breeds” (UNGR). Generally, UNGR is working to maintain national breeds and to promote the interest in reconstruction of totally or partly extinct Danish breeds.

With approx. 1,200 live dogs all over the world, the Broholmer is still a fragile breed. The gene pool is limited, and it is not possible to get new blood for the breed from abroad. The FCI registered Broholmer dogs abroad are all descendants of Danish Broholmer dogs and, therefore, they will not bring new blood to the breed.

To breed a genetically limited breed cannot be compared to breeding a genetically big and well-established breed. There is a lot more to consider when breeding a breed that is small in numbers.

With this RAS, we want to illustrate the development of the breed from the beginning of the reconstruction in the 1970'es and until today. We will look at the 4 big parameters: Health, Mentality, Exterior and Genetic Variation. Where are we now– and, not least, where are we heading?





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CHAPTER 1 – THE BROHOLMER

1.1 - History

The Broholmer is an old Danish breed and is categorized as a molosser of Mastiff type. As type, the breed has been known since the Middle Ages where dogs like the Broholmer were used a.o. for stag hunting and, later, mostly as guarding dogs on the bigger Danish farms and castles.

Around 1850, Kammerherre (Lord) Niels Frederik Bernhard Sehested (1813-1882) at the estate of Broholm in Gudme in the southern part of Funen decided to reconstruct and pure breed the old Danish dog since the breed was becoming extinct at the time. Therefore, the breed was called the Broholmer dog. He gave puppies to people in Denmark, but they came with the condition that the new dog owners should participate in the breeding work. Amongst others, King Frederik VII and Countess Danner owned several Broholmer dogs. Furthermore, the Copenhagen Zoo also received dogs from the breeding of Kammerherre Sehested.

The first breed standard for the Broholmer was written in 1886 by a.o. the son of N.F.B. Sehested, namely Hannibal Sehested.

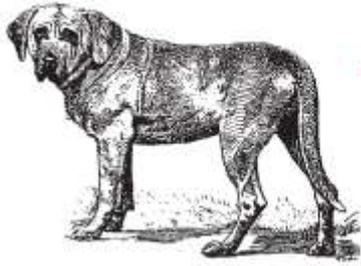
In the beginning of 1900's, the breed began to go down in numbers, a.o. due to inbreeding problems, distemper, and other epidemic diseases. The last dogs were registered during the 1950'es and, subsequently, the breed was considered extinct in the next decades.

Luckily, in the beginning of the 1970'es, committed members of DKK began to take an interest in the disappearing Broholmer dogs and this was the starting signal for the reconstruction of the breed which has led to the Broholmer dog of today.

1.2 – The beginning of the reconstruction

In the beginning of the 1970'es, it was made known from various sources that a few Broholmer dogs could still be found throughout the country. Therefore, DKK launched a search for Broholmer dogs with an article in the member magazine "Hunden". The article caused several inquiries and contact was established to the yellow 11-year old Bjørn who, unfortunately, turned out to be sterile, and the black 7-year old Manne. We know that Manne was born with some Broholmer blood in him, and it turned out that he had produced several puppies over the years, a.o. with a St. Bernhard female.

Later, Manne was mated with his granddaughter after the before mentioned St. Bernhard female and a boxer dog – and this mating produced a yellow male of the desired Broholmer type, called C. Bastian. It was not easy to find suitable females for C. Bastian, so a search was started in all Danish papers and local papers. After some time, the female Muffe was found. This resulted in 12 puppies, of which 4 were suitable for the



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reconstruction. The 4 (3 males and 1 female) were registered in the DKK X-register and they formed the basis for the reconstruction.

In 1978, the breed needed new blood. Two litter siblings after a Spanish Mastiff and an English Mastiff were bought in Holland, and the female was mated with one of the first X-registered Broholmer males. All the time, it was avoided to mate siblings, but, of course, line breeding had to be used since the gene pool was very limited.

In 1979, the Society for the Reconstruction of the Broholmer Breed – later Broholmerselskabet – became an independent breed club. Until then, the club had been run by the DKK Committee for National and Forgotten Dog Breeds (UNGR). It was not yet considered as a breed club. The club operated as a support for UNGR. In 1982, the old breed standard from 1886 was updated and approved by FCI.

During the 80'es, breeding approval judgments were held, where X-registered dogs were judged by UNGR to evaluate whether they were suitable for the further breeding work. In the course of time, the number of dogs increased, and the Broholmerselskab wanted to influence the breeding which had so far been controlled by UNGR. In 1994, a member of Broholmerselskabet was invited to represent Broholmerselskabet in UNGR and one year later, another 2 members of Broholmerselskabet joined the UNGR.

1.3 – The more recent reconstruction

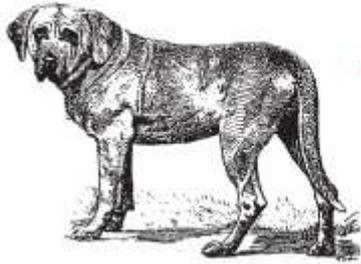
In 1996, an official cooperation agreement was established between DKK and Broholmerselskabet and, at the same time, it became possible to get an X-register pedigree for the dogs, i.e. a pedigree without the approval of FCI.

Over the years, it had turned out to be difficult to maintain the black type. Therefore, in 1996, the DKK advised Broholmerselskabet to focus more on preserving the black type. Again, a search for black dogs was initiated all over the country, and a black male was found; a relative of the female Muffe. The male was judged and found suitable to be part of the breeding work and, in 1997, he produced his first litter.

Now, Broholmerselskabet started the work to obtain international acknowledgement for the breed, and, in 1998, the day where the breed obtained international acknowledgement by FCI finally came, and it became possible to get normal DKK/FCI pedigrees. At the same time, Broholmerselskabet became an official Breed club under DKK with full responsibility for the further breeding work. The FCI approval also meant that the pedigree was closed, and it was no longer possible to take non-FCI dog into the breeding.

1.4 – Today

Up until January 1st 2015, the breed was in the hands of Broholmerselskabet. However, on January 1st 2015, the breed was transferred back to the UNGR and DKK, and breeders no longer had to apply

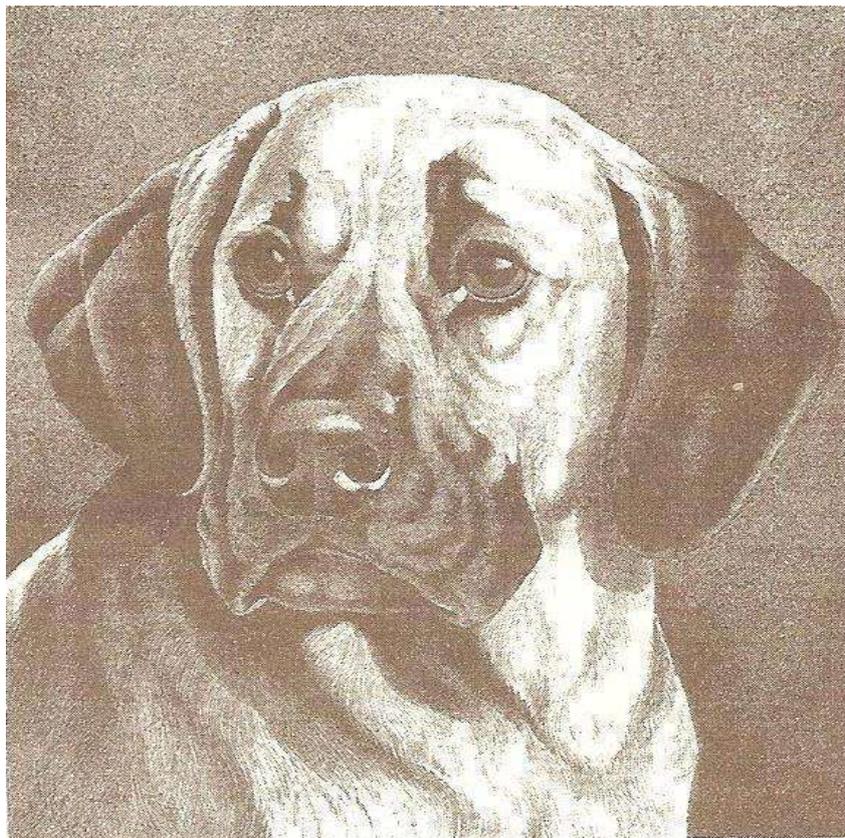


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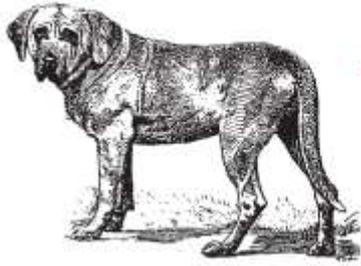
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Broholmerselskabet for mating permits; the breeders were now free to plan and be responsible for their own breeding, provided that the breeding restrictions stated by the DKK were met.

The exterior descriptions were abolished. Now in order to be approved for breeding the dogs had to achieve at least the predication Very Good at an official DKK/FCI dog and furthermore the judge had to be among the judges that the DKK had appointed to approve the breed. From January 2018 the dog had to be at least 24 months old in order to be approved for breeding.



Ideal Dänischer Dogge.
(Nach einer Zeichnung von J. Bungartz.)
(Illustration aus dem *Illustrierten Muster Hunde Buch.*)



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CHAPTER 2 - HEALTH

2.1 - In general

Overall, the Broholmer is a healthy breed. This is partly due to the many years with controlled breeding.

During the first years of the reconstruction, there were only very few dogs, therefore we had a very good general view of the health of the dogs throughout their whole life. However, as the number of dogs increased gradually, a compulsory health form was introduced in order to keep up the general knowledge of the development of the breed, also regarding the health of the breed.

Up until 2015, a buyer had to pay the price of the puppy plus a deposit of DKK 2,500. - to the breeder. At the same time, the buyer had to sign a document stating that the dog had to participate in an exterior description, mental description, and to be HD/ED X-rayed.

Part of the amount was pre-payment for the exterior description and another part was pre-payment for the mental description. The rest of the amount was a deposit for the HD/AD X-raying. When the dog had participated in all 3 tests, the deposit was returned to the buyer.

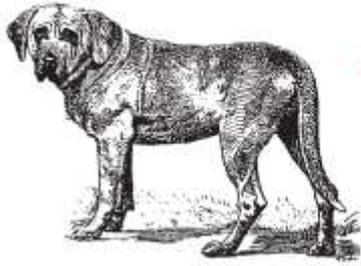
Broholmerselskabet was responsible for inviting the dogs for the exterior description, the mental description, and for reminding the owners to do the X-rays. At the same time, Broholmerselskabet sent a health form to the dog owners which had to be handed over to the dog's vet who would fill in the form and the owner would then return it to Broholmerselskabet.

The idea of the deposit was, that it was an incentive for the dog owners to let the dog go through the exterior description, mental description, and X-raying – and it worked. Almost all dogs participated in all 3 tests, and almost all dog owners returned the health forms correctly filled in.

The health information was used actively by The Broholmerselskab in the breeding work; for each mating it was checked which information was available on both dogs, their siblings, and their parents. If e.g. there was an allergy found with the siblings of both dogs, it was not possible to obtain a mating permit for this combination.

When the breeding was given free in 2015 and the exterior description was stopped and for some years completely abolished, it became difficult to convince both breeders and buyers to still pay the deposit. Unfortunately, this had some negative consequences as it also meant that the health form disappeared.

Apart from the missing health information on our dogs, it has also over the past years caused a decrease in the number of dogs being X-rayed, and we have also seen a decrease in the number of dogs participating in the mental description as well as the re-introduced exterior description. The tendency now is that you only participate in the 3 tests if you want to use your dog for breeding. This means that we lose invaluable



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knowledge about our breed as we also experience a big decrease in the number of breeders and dog owners who inform Broholmerselskabet of the reasons for sickness or death of their dogs.

Apart from what can be found online at DKK's dog database, most of our knowledge about the breed today comes from social media, especially the many Broholmer groups which have been established.

In the next sections we will deal with the most important challenges we are now facing with the breed in terms of health

2.2 – Joints and bones - HD

Like all Giant breeds, a Broholmer dog may experience problems with the skeleton in the form of specifically hip joint dysplasia (HD) and elbow joint dysplasia (ED).

Luckily, from the very beginning of the reconstruction, we have focused a lot on the size and the skeleton of the dogs, and there was an early demand to know the HD and ED status of the dogs used for breeding.

In the beginning, when the gene pool was very small, we were forced to use dogs with HD and ED in the reconstruction, but already back then we tried to mate a dog with HD with a dog without HD. Eventually, as the breed increased in numbers, we were able to be more selective.

From 2006 to December 31, 2014, the breeding had to follow the below restrictions as far as HD was concerned

Puppies can only be registered in the DKK if both parents – before the mating – have been X-rayed for HD with the following status: HD status A, B, or C, and the average index number for both parental dogs must not be lower than 100 at the time of the mating (male + female divided by 2 has to be at least 100). The dog's own HD status must be included in the index number. HD D and E must not be used for breeding.

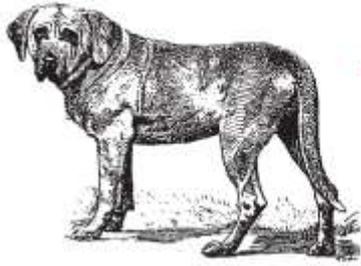
Furthermore, it was attempted to breed according to the below HD recommendations:

A dog with HD A could be mated with a dog with HD A, B + C.

A dog with HD B could be mated with a dog with HD A + B.

A dog with HD C could be mated with a dog with HD A.

As earlier mentioned, the breed was placed under the UNGR again as per January 01, 2015. This caused changes in the HD restrictions and recommendations for the breed.



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From January 01, 2015 to December 31, 2017 the breed had the below mentioned HD restriction:

Puppies can only be registered in the DKK if both parents have an official HD status registered with DKK before the mating. A dog with HD grade D or E may – as an exception – be used for breeding if the breeder considers that the dog's total contribution to the breed will be positive. In such case, the breeding partner must always be HD free (grade A or B). Furthermore, it is recommended for the breed that the total HD index for both breeding partners should be minimum 200.

On January 01, 2018 there was another small change to the HD restriction for the breed since the breed now became included in the rules of DKK for the Basic Pedigree and Pedigree Plus. This means that the HD restriction as of today is as stated below:

January 01, 2018 – December 31, 2020

Puppies can only be registered in the DKK if both parents have an official HD status registered with DKK before the mating. A dog with HD grade D or E may – as an exception – be used for breeding if the breeder considers that the dog's total contribution to the breed will be positive. In such case, the breeding partner must always be HD free (grade A or B).

Breeding recommendations:

To obtain the Pedigree Plus with this statement: "This dog has been bred in accordance with the breeding recommendations of Broholmerselskabet and DKK", the following must be fulfilled:

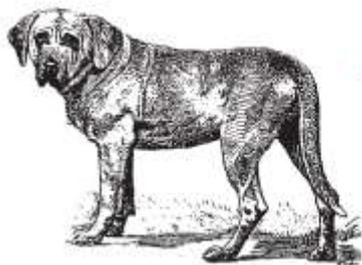
- 1. Exterior description: The dog must have an exterior description from the Broholmerselskabet.*
- 2. HD index: The total HD index of the breeding couple must be minimum 200. The dog's own HD status must be included in the index calculation.*

So, the biggest change was that, as per 2015, it became possible to use dogs with HD D + E in the Broholmer breeding, and that the use of HD index as a restriction was dropped, and made into a recommendation and, since 2018, it became a must in order to obtain a Pedigree Plus for puppies.

At the time of writing this report, no dogs with HD D + E have been part of the breeding.

We have seen matings where the HD index recommendation has not been fulfilled. What this will mean for the HD status of the breed in the future, is not yet known.

There is no doubt that the many years with "strict" breeding restrictions for HD have been successful. We see only very few dogs being diagnosed with HD D + E in the breed.



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The table below shows the distribution of HD results in the breed during the last 10 years

HD status/No of dogs X-rayed	A	B	C	D	E
774	62,9 % (487 dogs)	20,7 % (160 dogs)	11,9 % (92 dogs)	3,6 % (28 dogs)	0,9 % (7dogs)

This table shows the development of HD in the breed from January 01, 2010 to December 31, 2017:

Diagnosis	2010	2011	2012	2013	2014	2015	2016	2017
HD A	26 (37,14%)	47 (46,08%)	57 (66,28%)	78 (72,90%)	61 (70,11%)	61 (67,78%)	58 (67,44%)	56 (65,88%)
HD B	28 (40 %)	27 (26,47%)	21 (24,42%)	15 (14,01%)	11 (12,64%)	16 (17,78%)	13 (15,12%)	16 (18,82%)
HD C	13 (18,57%)	22 (21,57%)	7 (8,13%)	11 (10,28%)	9 (10,34%)	6 (6,98%)	8 (9,30%)	12 (14,11%)
HD D	2 (2,86%)	4 (3,92%)	1 (1,16%)	2 (1,87%)	6 (6,90%)	6 (6,98%)	7 (8,13%)	1 (1,18%)
HD E	1 (1,42%)	2 (1,96%)	0	1 (0,93)	0	1 (1,11%)	0	0
Total	70	102	86	107	87	90	86	85

2.3 – Joint and bones - ED

The Broholmer is a dog with a sturdy and heavy front where the front part must be strong and carry a considerable part of the dog's weight. Therefore, we have for many years – apart from the HD – also been focusing on ED in the breed.

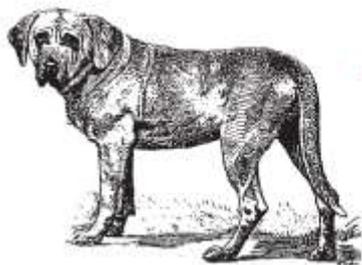
From 2006 to December 31, 2014 breeding has been carried out according to the following restriction regarding ED

Only dogs with ED status 0 or 1 can be used for breeding.

Furthermore, the below mentioned guidelines were used:

A dog with ED 0 can be mated to a dog with ED 0 + 1

A dog with ED 1 can only be mated to a dog with ED 0



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As with HD, there was also a change in the ED restriction of the breed when the breed was taken back to the UNGR in 2015.

ED Restriction from 2015 – December 31, 2019:

Puppies can only get a DKK pedigree if both parents have an official ED status registered with DKK before the mating. A dog with ED grade 3 may – as an exception – be used for breeding if the breeder considers that the dog's total contribution to the breed will be positive. In such case, the breeding partner must always be ED free (grade 0).

Up until now, no dogs with ED 2 + 3 have been used in the breeding

In the DKK it is not possible to calculate ED index.

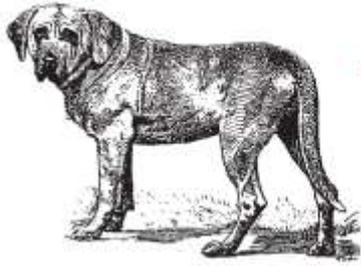
The table below shows the distribution of AD results in the breed during the last 10 years:

ED status/no. of dogs x-rayed	0	1	2	3
770	71,3 % (549 dogs)	21,4 % (165 dogs)	4,4 % (34 dogs)	2,9 % (22 dogs)

Again, it is obvious that the many years with the "strict" breeding restrictions for the ED area have been beneficial for the breed.

This table shows the development of ED in the breed from January 01, 2010 to December 31, 2017:

Diagnosis	2010	2011	2012	2013	2014	2015	2016	2017
ED 0	51 (72,86)	75 (73,52%)	63 (75%)	64 (59,26%)	59 (67,81%)	59 (68,60%)	64 (77,10%)	63 (75,90%)
ED 1	12 (17,14%)	22 (21,57%)	17 (20,23%)	33 (30,56%)	21 (24,13%)	18 (20,93%)	13 (15,66%)	15 (18,07%)
ED 2	2 (2,86%)	2 (1,97%)	2 (2,38%)	7 (6,48%)	3 (3,45%)	8 (9,30%)	2 (2,41%)	5 (6,02%)
ED 3	5 (7,14%)	3 (2,94%)	2 (2,38%)	4 (3,70%)	4 (4,60%)	1 (1,16%)	4 (4,81%)	0
Total	70	102	84	108	87	86	83	83



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2.4 – Joint and bones - OCD

OCD (Osteochondrosis dissecans) is a growth disturbance particularly seen in the big and fast-growing breeds. Therefore, the Broholmer is – due to size and growth pattern – pre-disposed for OCD.

The growth disturbance can be seen in the so-called ossification process where the very soft cartilage of the puppy/young dog is slowly being transformed into harder cartilage. If the cartilage is indurated too quickly, it may crack, causing the joint fluid – which is normally encapsulated – to get in contact with the bone. The crack may end up as a loose flap which will break off and flow freely in the joint, in which case it is called a joint mouse.

OCD is mostly seen in young dogs at the age of 9-10 months. It is mostly seen in the shoulder joint, but OCD can also be seen in knee and hock joint. Very often, the dog in question will be limping and the disease will then need an operation. The disease is often bilateral.

Sometimes, it is possible that OCD does not cause a noticeable limp and therefore it is not discovered. Dogs with an untreated OCD have a big risk of developing arthritis in the joint in question.

There is no restriction saying that the Broholmer must be X-rayed for OCD and therefore there is no available OCD statistics for the breed. Nevertheless, some owners choose to have their dogs X-rayed for OCD in connection with the HD/AD X-raying. Therefore, we do come across the dogs with a known OCD status on one or both shoulders.

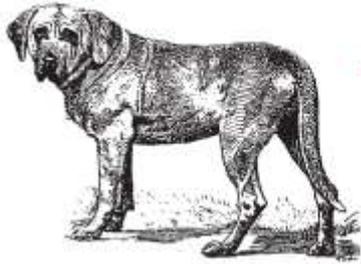
We do know that OCD is present in the breed and that operations are performed every year on young dogs, especially for OCD in the shoulder but also in the knees. As already mentioned, we do not know the exact extent of the problem

2.5 – Joint and bones - Spondylosis

In Denmark, the Broholmer is not automatically X-rayed for spondylosis; but in Finland they do this. Here, it was observed at an early stage that there were young Broholmers being diagnosed with spondylosis in varying degrees of difficulty.

Recently, we have seen the same tendency in Denmark that an increasing number of younger dogs are being diagnosed with spondylosis in varying degrees of difficulty.

Unfortunately, spondylosis – as well as OCD – is rarely registered on the DKK web site for the Broholmer for which reason our statistical material in this area is rather inadequate.



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Based on the reporting to Broholmerselskabet over the years, we get a picture of a certain heredity; i.e. if you have a litter where a young dog is diagnosed with spondylosis, you will often see the same disease in several of his litter siblings.

Below you will find the Broholmer spondylosis statistics for Finland. The figures have been taken from the web site of The Finnish Kennel Klub, Kennelliitto, which is the equivalent site of the DKK "hundeweb".

Year of birth	No. Of births	Grade 0	Grade 1	Grade 2	Grade 3	Grade 4	Totally
2010	16	-	-	-	1	-	1
2011	15	-	-	-	1	1	2
2012	1	-	-	-	-	-	-
2013	23	6	1	4	-	-	11
2014	17	4	-	-	-	-	4
2015	14	2	4	2	-	-	8
2016	16	5	2	1	-	-	8
2017	44	-	-	-	-	-	-
2018	17	-	-	-	-	-	-
I alt	163	17	7	7	2	1	34

With the knowledge we have at the time of writing this report, the incidence of spondylosis in the breed is a development that we will follow closely.

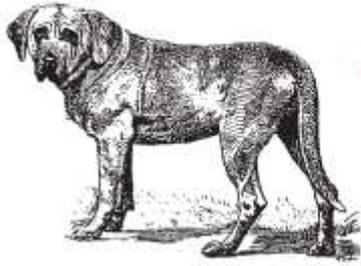
2.6 – Joint and bones – Degenerative Myelopathy (DM)

DM is a slowly progressing disease in the spinal cord which is primarily seen in German shepherd dogs. However, this disease can also be seen in the giant breeds. The symptoms of DM are a slowly increasing unsteadiness and paralysis of the hind part. Limping on either one or both hind legs may be experienced. It has not been established that the disease is causing pain for the affected dogs.

DM is mostly affecting older dogs at the age of 8-14 years. The diagnosis is a so-called exclusion diagnosis which means that you begin with excluding HD, spondylosis etc. If no other explanation can be found regarding the dog's symptoms, then the dog may be diagnosed with DM – however, the final diagnosis can only be made through an autopsy.

DM has not been found in the Broholmer before and, as far as we know, no diseased Broholmer dogs have undergone an autopsy, resulting in a DM diagnosis postmortem.

The course of DM has not been conclusively established at the time of writing this report. In the USA, a group of researchers have found a gene which could be important for the development of DM. Therefore, a DNA



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test can now establish whether a dog carries 1 (heterozygote) or 2 copies (homozygote) of this gene, or whether the dog does not carry the gene at all. It is believed that dogs who are homozygote for this gene may develop DM at some point during their lifetime.

However, the test is not completely conclusive as DM has been seen in dogs who do not carry the gene and we have seen homozygote dogs who never developed DM. The latter is partly explained by the fact that the mutation has a so-called “variable penetrance”.

In 2017/2018, we heard of a Broholmer in the USA who seemed to have DM. The dog has not been bred within Broholmerselskabet or a cooperative society. The owner of the dog used social media to inform about the DM in this dog, causing insecurity with many Danish Broholmer owners.

As far as we know, the dog was 8 years old when diagnosed and died at 9 years of age. Whether an autopsy was carried out subsequently to confirm the diagnosis is unknown.

We know that many older Broholmer dogs develop problems with the hind part and are put to sleep because of this. Whether the problem is due to general old age, DM, or something else is unknown as it is not customary in Denmark to carry out an autopsy on old dogs.

We strive to be updated as far as research in DM is concerned.

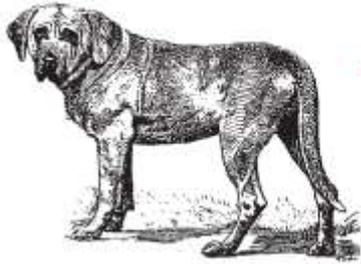
2.7 – Broholmer Hearts

In 2012/2013, a couple of young dogs in Denmark were diagnosed with severe aortic stenosis (hereafter called SAS), both not yet 2 years old. In Germany, severe SAS was also found with a young dog under 2 years of age. In 2013, a puppy was diagnosed with moderate SAS and light pulmonary stenosis and had to be euthanized the age of 4 months. The 3 dogs with SAS did not live more than 3-5 years.

A thorough examination of the dog database as well as checking with former dog owners showed that from the beginning of the reconstruction there were sporadic cases of SAS and other heart diseases, as well as sporadic cases of inexplicable deaths amongst younger dogs.

This was the starting signal for the Project Broholmer Heart which was established in cooperation with the heart experts of the University Hospital for Family Animals at Copenhagen University (hereafter called KU). Broholmerselskabet selected and paid for a screening of the heart for approx..70 dogs.

The first screenings were of dogs approved for breeding and related to dogs with a known heart disease. This step was taken to prevent breeding with sick dogs. Then there were a number of screenings within a broader selection of the dogs in the breed; some dogs and owners were invited



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to participate by Broholmerselskabet; other dog owners signed up voluntarily to put their dogs at disposal for the Project.

The purpose of these screenings was first and foremost to pinpoint the extent of heart diseases within the breed, and secondly to investigate the heredity of heart diseases in the Broholmer breed. All dogs were screened by a vet from the EKKO team and, at the same time, all dogs delivered a blood sample to be analyzed at a later stage.

The project showed that SAS and other heart diseases did exist hidden in the breed and that we must take this into consideration when breeding. KU is therefore recommending that all Broholmer dogs should be screened before breeding.

Luckily, in the time after the Heart Project, we did not see any new cases of serious heart diseases. A few dogs were diagnosed with grey zone SAS or mild SAS. Unfortunately, this had the effect that many breeders and dog owners decided that SAS was not an important issue for our breed. Therefore, today, many breeders do not get heart scan their female dogs, and some also use males with no heart scan in spite of the KU recommendation that all breeding dogs must have a heart scan before being used for breeding.

Unfortunately, the use of dogs that are not heart scanned means, that, once again, we see sudden and unexpected deaths amongst young dogs as well as litters where several dogs are diagnosed with a heart disease. In Germany, a young dog died unexpectedly and suddenly in September 2018. At the time of writing this report, the autopsy report is not finished but preliminary investigations show that the dog died from poisoning with rat poison. However, at the autopsy it was also concluded that there were changes to the heart and liver which cannot be due to the poisoning.

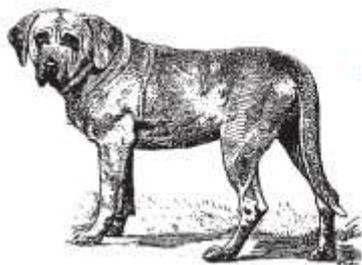
Two litter siblings have subsequently had a screening of the heart, and both were diagnosed with mitral valve insufficiency (leaky heart valve between the left auricle and ventricle).

In Sweden, a puppy has just died at the age of 5 months – cause of death: heart disease with an enlarged heart.

In Denmark, a very young puppy has been euthanized in August 2018 due to severe SAS. A following heart screening of the mother showed that she suffers from mild SAS. Also, in Denmark, a young female dog at the age of 4 years died during the Summer of 2018 due to an enlarged heart and fluid in the lungs. Also, a 6-year old female dog has been euthanized with the same diagnosis. This female had had a heart scan earlier and found free of SAS. However, she was diagnosed with aorta regurgitation (leaky aorta valve).

A young male dog in Denmark has recently been diagnosed with annuloaortal ektasi – a large ascending aorta or aorta dilatation. This means that the root of the aorta has expanded/dilated.

The same diagnosis was given to a young female a few years ago. We observed the same tendency with several siblings from the same litter at the beginning of the Heart Project. At the time, KU called it the substrate for SAS. Both we and KU are very concerned about finding it with yet another young dog. It should



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be mentioned here that the father of the young male has grey zone SAS with a heart murmur. The young female who was diagnosed recently is related to the litter from the beginning of the Heart Project.

Furthermore, we know that a male in Holland has died from dilatated cardiomyopathy, DCM, which is a disease to the heart muscle with enlarged heart and reduced pumping function. We know of yet another dog with an enlarged heart as well as a few foreign dogs with other heart problems.

It is very worrying that today – almost 5 years after the beginning of the Heart Project – we see a fresh outbreak of heart diseases. This is something that we should all take very seriously.

Appendix 1 shows an outline of the screening results for the breed.

In the final phase of the Heart Project, KU listed the below mentioned recommendations for the breed:

All breeding dogs should undergo a heart scan before being used for breeding. The heart scan is not to be carried out until the dog is at least 12 months old.

GRAD 0 (Free)	Dogs with an aortic flow below 2.00 m/s (Grade 0) may be used with dogs with Grade 0 and Grade 1.
GRAD 1 (Grey area)	Dogs with an aortic flow 2.00 – 2.25 m/s (Grade1) may be used with dogs with Grade 0 and Grade 1.
GRAD 2 (Mild)	Dogs with an aortic flow 2.25 – 3.50 m/s (Grade 2) should not be used for breeding unless the dogs have characteristics that are vital for the reconstruction. If used, a dog with Grade 2 should only be used with dogs with Grade 0.
GRAD 3 (Moderate)	Dogs with an aortic flow 3.50 -4.50 m/s (Grade 3) should not be used for breeding
GRAD 4 (Severe)	Dogs with an aortic flow from 4.50 and up (Grade 4) should not be used for breeding

As per KU, dogs that show other heart diseases should not be used for breeding.

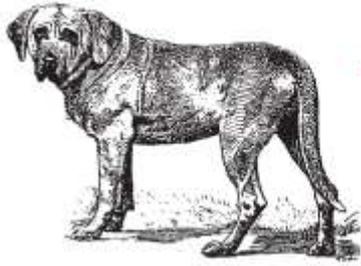
2.8 – Skin problems

In dogs skin problems can be many different things – from allergy to inflammatory conditions and fungoid infections – or the fact that the dog has another disease as e.g. metabolic disorder which a.o. may cause skin symptoms.

Furthermore, there are various types of cancer to the skin as e.g. mast cell tumors, as well as benign tumors, like histiocytomas.

The latest health review of the whole breed took place in 2012. It clearly showed that there are many Broholmer dogs with skin problems of one or the other kind.

We received 188 replies and they were divided as can be seen below:



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40 – answered yes, their dog suffered from skin itching to some extent.

59 – answered yes, their dog had had ear problems as e.g. fungus, reddening, or inflammation.

30 – answered yes, their dog suffered from loss of fur more than the normal shedding.

23 – answered yes, their dog suffered from paw problems like reddening or furunculosis.

30 – answered yes, their dog showed signs of allergy.

26 – answered yes, their dog had been diagnosed with allergy.

After the health review, Broholmerselskabet began to cooperate with the vet Flemming Kristensen who is an expert on skin problems with dogs. Flemming participated in a couple of exterior descriptions where he examined the participating dogs after previous agreement with the owners. Flemming examined 40 dogs and concluded the following:

18 had skin problems due to lack of EFA oil in their feed.

9 had epidermal cysts.

14 had skin problems not related to malnutrition or epidermal cysts.

According to Flemming Kristensen, the last 14 were divided as follows:

6 suffered from metabolic disorders.

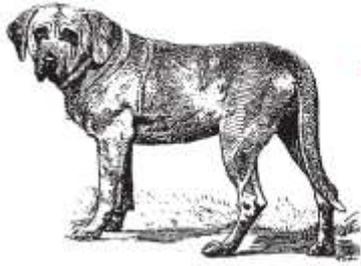
2 suffered from allergy.

6 needed further examination.

At the time, Flemming Kristensen concluded that many dogs are diagnosed with allergy by their own vet on a very slender basis. He requested that in matters of skin problems, a vet with expertise in skin diseases should be used to obtain a correct explanation and diagnosis.

We assume that the situation is still the same as during the review in 2012.

Skin problems are not being registered with the DKK, so we must rely on breeders as well as dog owners to inform us in case their dog is diagnosed with allergy or skin cancer.



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2.9 - Cryptorchidism

Earlier, it was assumed that cryptorchidism was a condition that only female dogs were responsible for. It was the belief that the female dog carried a hidden gene for this condition and that, in some cases, it was passed on to the male puppies, who then were cryptorchids.

Today, we know that the process of descending of the testicles is very complicated and that a lot can go wrong in this process. The belief is now that both the female and the male carry a certain number of susceptible genes for cryptorchidism and pass it on to their offspring. However, the precise hereditary succession has not yet been established.

DKK considers a male cryptorchid if, by the age of 9 months, he is lacking one or both testicles in the scrotum.

As far as the Broholmer breed is concerned, we see cryptorchid male dogs regularly. In the database covering all Broholmer dogs we have noted 113 cryptorchid male dogs over the years. We do know, however, that there is a hidden figure as well. Until 2015, almost all Broholmer dogs participated in the exterior description, and here it was noted if the dog was cryptorchid. Unfortunately, today, it is the tendency that if you have a cryptorchid male dog, then the owners do not want to participate and therefore we lose the overview regarding the existence of cryptorchidism in the breed.

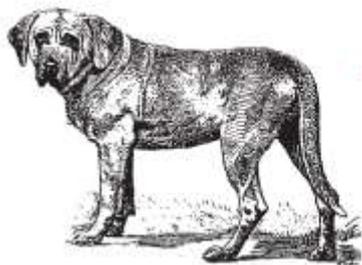
We do know, however, that in some lines of the breed there is an increased existence of cryptorchidism, and that it only appears sporadically in other lines.

2.9 – Health – other issues

As mentioned in the beginning, the Broholmer is generally a healthy breed. Apart from the issues described above, we also see intermittently stomach turning in the breed. As stomach turning is a problem in many breeds, a lot of research is going on internationally – both to find out if and, affirmatively, how it is passed on to puppies – and, of course, also to find out how to best avoid it.

There are sporadic cases of bone cancer and other types of cancer in the breed, and we also see sporadic cases of metabolic disorders, epilepsy, and meningitis.

The Breeding Committee tries to remain updated on what is going on in the breed but – as mentioned earlier – we must rely on breeders and owners to inform us in case of diseases.



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CHAPTER 3 – MENTALITY

Before 2015, almost all Broholmer dogs participated in the mental description which gave us a very good overview of the development of the breed with regards to mentality. Furthermore, almost all dogs participated in the exterior description where the judge also evaluates the dog's temperament in the given situation.

With the transfer of the breed to DKK as per January 01, 2015 there is, unfortunately, not many Broholmer dogs any more who go through a mental description. As with HD and ED x-rays and exterior descriptions, it is often only owners who want to breed that choose to do a mental description with their dogs. This means that we lose a lot of knowledge – both about the mentality of the individual dog and what is passed on – as well as knowledge about the general direction of the breed.

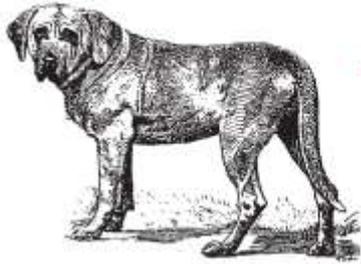
The below table shows the number of Broholmer dogs with a mental description from 2008-2017:

Year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
No. of descriptions	50	96	96	88	125	110	60	71	73	66
No. of puppies born	89	121	107	132	140	134	129	94	141	148

The below diagram shows the ideal mental profile of the breed in blue, compared with the average results of the breed from the mental descriptions in the period from 2010-2017:

Translation of the different test moments:

- 1a Kontakt =Contact
- 1b Håndtering =Handling
- 1c Håndtering = Handling
- 2a Leg, engagement = Play – engagement
- 2b Leg, greb =Play – grabbing
- 3a Jagt, fart, 1. gennemløb = Hunting – speed – 1st run through
- 3a Jagt, fart, 2. Gennemløb = Hunting – speed – 2nd run through
- 3b Jagt, fangst 1. gennemløb = Hunting – grabbing – 1st run through



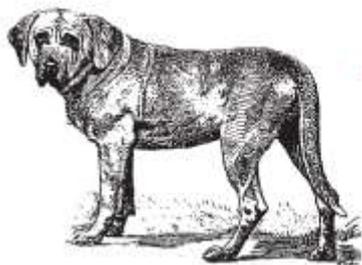
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3c	Jagt, fangst 2. gennemløb = Hunting – grabbing – 2 nd run through
4	Aktivitetsniveau = Activity level
5a	Overraskelse, skræk = Surprise – fear
5b	Overraskelse, trusler/angreb = Surprise – threats/attacks
5c	Overraskelse, nysgerrighed = Surprise – curiosity
5d	Overraskelse, afreaktion = Surprise – abreaction
6a	Lyd, skræk = Sound – fear
6b	Lyd, nysgerrighed = Sound – curiosity
6c	Lyd, afreaktion = Sound – abreaction
7a	Spøgelser, skræk = Ghosts – fear
7b	Spøgelser, trusler/agressivitet = Ghosts – threat/aggressiveness
7c	Spøgelse 1, afreaktion = Ghosts – abreaction – ghost 1
7c	Spøgelse 2, afreaktion = Ghosts – abreaction – ghost 2
8	Skud = Shooting

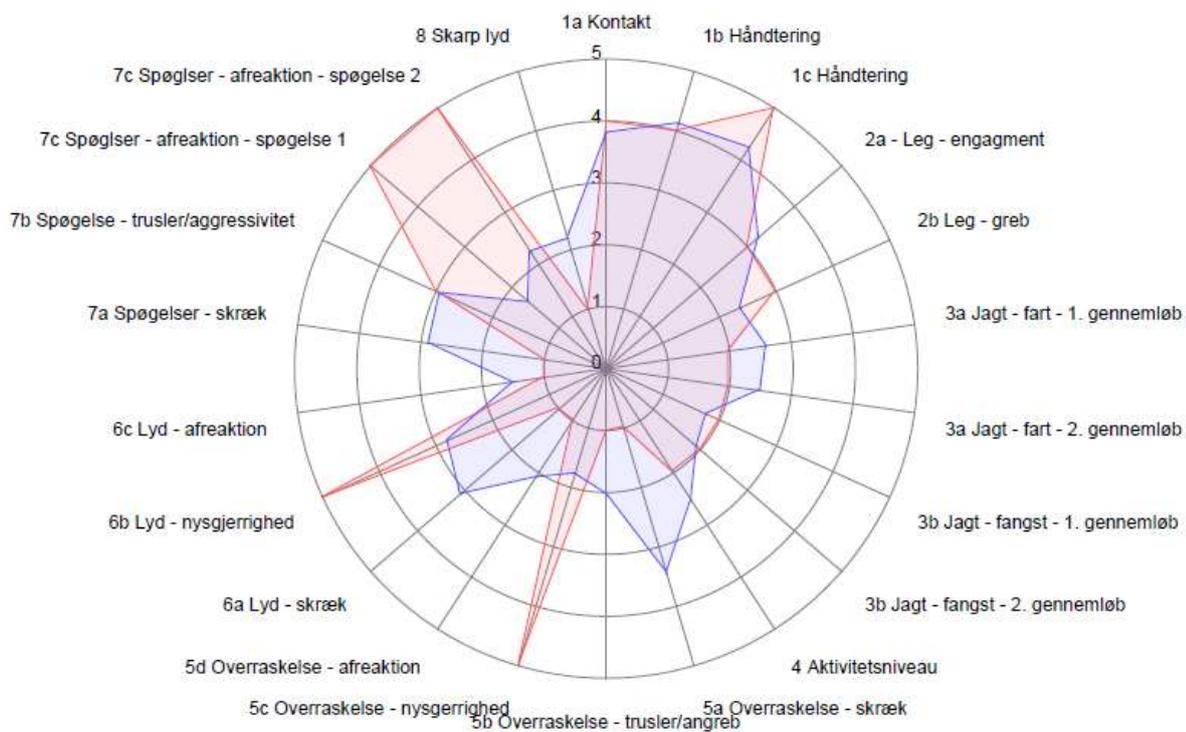
RED = Breed profile

BLUE = Breed average

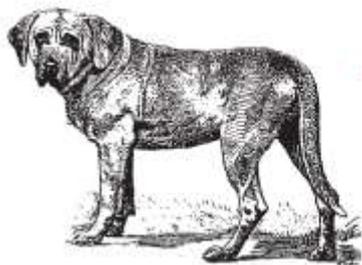


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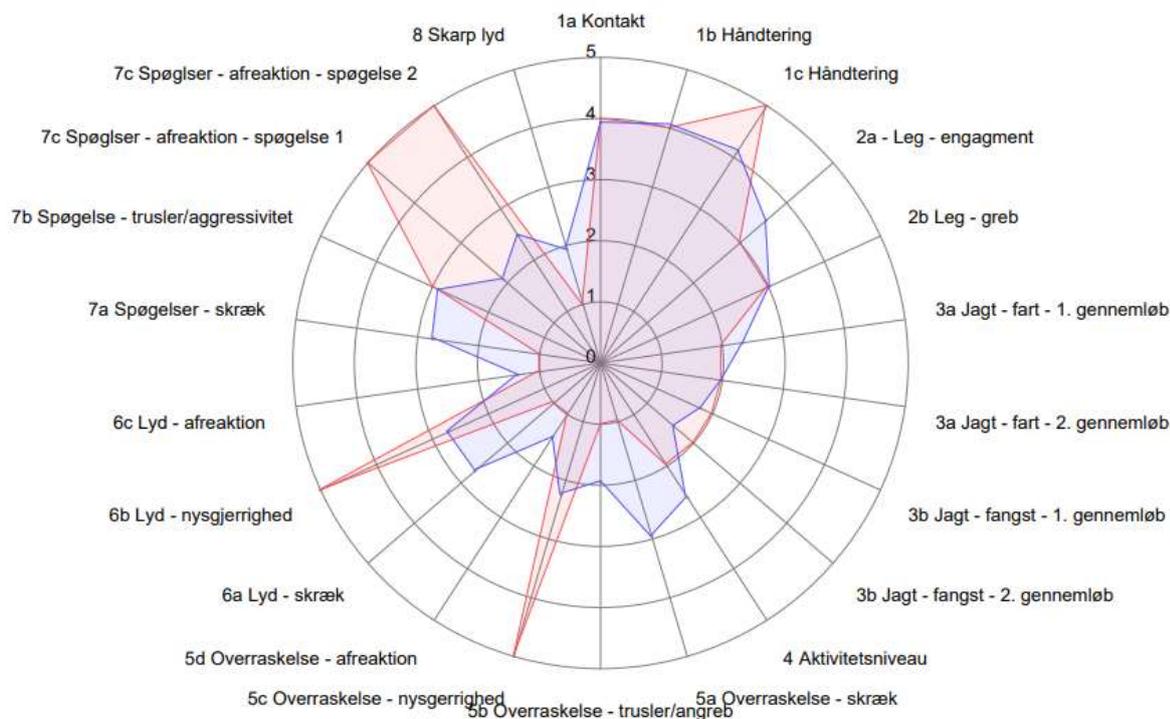


● Raceprofil ● Racens gennemsnit



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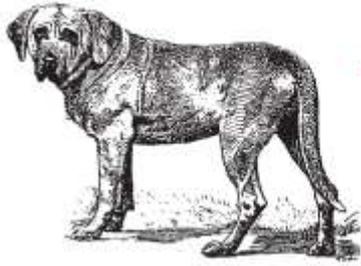


● Raceprofil ● Racens gennemsnit

As can be seen from the above, the breed has developed positively when it comes to fear, curiosity and abreaction, but we do still have a long way to go before the results regarding curiosity reach the breed profile. This means that mental wise we have to pay attention to increasing the amount of curiosity seen in the breed, as well as lowering the fear.

As far as mentality is concerned, it can always be discussed how much of the dog's behavior that is inherited – and that can be passed on to offspring – and how much is acquired behavior and a result of the environment in which the dog lives.

The best obtainable overview of what is assumed to be genetically is to be able to observe many dogs from the same line of the breed who live in different environments. What are the similarities and differences between these related dogs? In this case it is possible both to compare the mental descriptions and the everyday behavior of the dogs.



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According to the current breed standard, a Broholmer must have the following temperament:

Calm, good-natured, sociable but still vigilant. Must appear with great self-confidence.

Fortunately, this is also how we experience most of the Broholmer dogs today.

However, we do know of some lines of the breed where many of the related dogs show a restless, hyper-active and - now and then – very noisy behavior. Dogs who seem to be easily stressed and who have in general a somewhat higher activity level than should be expected in a Broholmer dog.

Given the size of a Broholmer, this is not an acceptable behavior for the breed. And it is also not in accordance with the breed standard which – as mentioned above – describes the Broholmer to be calm, good-natured, and sociable.

Such dogs are normally not “caught” during a mental description as this is executed as expected and often with a good result. The behavior can be seen when the dog participates in shows, walks, or other arrangements, and it is often seen that such behavior is passed on to offspring where you will see the same restless, hyper-active behavior being repeated.

Within 6 months in 2017/2018, 3 young Broholmer dogs have been euthanized due to behavior problems as described above. It may not sound like a lot, but all the courses of events have been long and very fatiguing for all parties involved, both dogs and owners.

As mentioned earlier, the breed has a small gene pool, and we have to be careful as far as selection is concerned. When choosing a breeding partner, you should take the above problems into consideration.

CHAPTER 4 - EXTERIOR

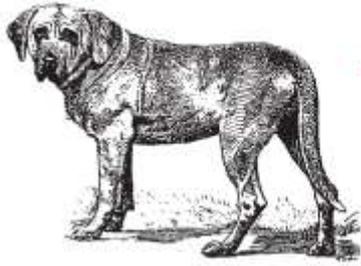
When you talk about the exterior of a dog, it is often a matter of type. But what exactly is “type”?

Breed type is the characteristics that make it possible for us to distinguish between the many different breeds of dogs. Type is present all over the dog: color and markings, type of fur, body proportions, and of course the head and its expression.

So, what is the type of the Broholmer breed?

If you read the breed standard, and if you concentrate only on the things in the standard that describe the breed type, it can be summarized as follows:

A big, heavy dog of Mastiff type, with a big, broad head where the skull is rather flat, and the stop slightly marked, round and not too big eyes expressing calmness; a sturdy and massive nose and jaw, not too long and always with a black nose; ears hanging along the cheeks; a powerful neck with distinct dewlap, a deep and broad front with a clearly marked chest. A dog with rectangular body proportions, with strong legs and



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heavy ground-covering movements. A dog where the front part must be heavier and broader than the back part.

Furthermore, the dog must have a short, adjacent fur with underwool, and the color must be black, reddish-golden, or yellow, the latter 2 colors with or without a black mask. All color varieties are allowed white markings on the chest, paws, and tip of the tail.

If you close your eyes and hear the above description, you can almost see a Broholmer before you.

If we should add other colors and another type of fur, red or liver colored noses, standing ears, light, elegant and square body proportions to the description, the image of the Broholmer disappears.

On the other hand, if one should add minor faults such as cow-hockedness, a bit high rear, somewhat large white markings, a bit short upper arm or a bit too long and flat paws, we can still see the Broholmer before us.

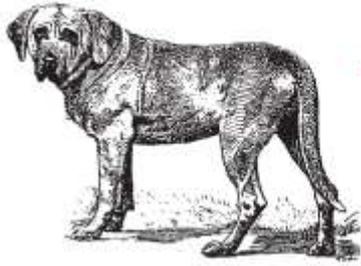
The dog's teeth and bite are also part of the exterior. Since the beginning of the reconstruction, we have seen dogs with faulty bites, both with overshot- and undershot jaws, as well as skew bite and missing teeth. More recently, we have unfortunately noted a tendency towards an increase in the number of dogs with both undershot jaw as well as overshot jaw. We also see a connection between pincer bites and undershot bites, as we tend to see more undershot bites in litters/lines with a tendency to pincer bites.

As mentioned earlier, according to the standard, 3 color variations are accepted: yellow with mask, reddish-golden, and black. All variants are allowed to have white markings on the chest, paws, and tip of the tail. In 2013, the then Breeding Committee started a color project with the purpose of investigating which kind of black we have in the breed.

Genetically, animals can carry 2 kinds of black, dominant black or recessive black. Only very few dog breeds are known to carry recessive black, so it was a big surprise when we found out that the Broholmer carries recessive black. For the breed it means that there are 2 ways in which a Broholmer can be black. Most of the existing black Broholmer dogs are dominant black, i.e. they carry either 1 or 2 genes of dominant black. These dogs will be able to produce black puppies with all breeding partners – whether the partner carries a gene for black or not.

However, we do also see a few black dogs which are recessive black, and red/yellow dogs that carry a hidden copy of the gene for recessive black. A dog who is recessive black can only produce black puppies if the breeding partner also carries the gene for recessive black. Unlike dominant black, where the puppy only must receive one copy of the gene to become black, a puppy must receive one copy of the recessive black gene from both parents in order to become recessive black. If a dog receives one copy of the recessive black gene, it is said to be the carrier of a hidden copy of the recessive black gene.

A dog can also get a red/yellow fur color in 2 ways. The dog is either recessive red or it is sable. The color project also proved that Broholmer dogs have both variants; however, the majority of the breed is sable. This means that all sable Broholmers genetically share the same color genes whether they are very light yellow



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or dark red. It is assumed that modifier/intensifier gene exists that decide if a sable dog will be light yellow or dark red.

It is not possible just by looking at a dog to determine if it is sable or recessive red, but a recessive red dog cannot produce black pigment. This means that all Broholmer dogs with black hairs is the fur pr. definition are sable.

As mentioned before the breed standard only calls for yellow dogs to having black masks. But as we now know that the majority of yellow and red dogs are sable and get their sable color from the same genetics, it no longer makes sense that only yellow Broholmers are allowed to have black masks.

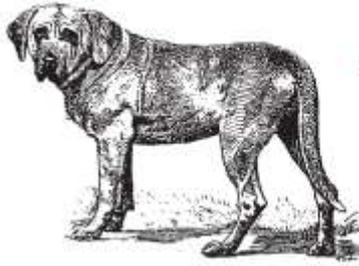
To make things more complicated, the Broholmer dog can also get its' white markings in 2 different ways. It is assumed that some white markings are due to the fact, that the body ran out of pigment before the re color covered the entire body of the dog – a bit like a jacket that can no longer cover the body and be buttoned up. Other than this kind of white markings the color project proved that some of the white markings in the breed is due to a gene called piebald. Piebald is a rather unpredictable gene and is difficult to work with as it is impossible to know for sure how it will manifest itself. Often, a dog that carries one copy of piebald will show a normal amount of white markings, but other times dog carrying one copy of piebald will have excessive white markings, for example white socks, and when it is most unpredictable a carrier will have a white collar around the neck or white spots on parts of the body, where we would normally not expect to see white markings. Piebald is also the gene that is responsible for the birth of "blomstrede" or spotted Broholmers. If a dog gets one copy of piebald from both its' parents it will become white with sable or black spots, depending on its' basic color.

Especially at the beginning of the reconstruction we saw Broholmer dogs that were black and tan (Rottweiler color). In the color project we found a few – both sable and black dogs – who carried a hidden copy of black and tan. The last black and tan puppy was born in 2012. If 2 dogs are mated and they both carry a copy of black and tan, 25% of the puppies will statistically be born black and tan

In 2008, a litter of puppies was born and 3 of the puppies turned out to be long-haired. Both parents and all the puppies went through a DNA test to determine the paternity and, with the result of the test, it was obvious that the breed comprises dogs that carry a copy of the gene that codes for long hair. The color project and several of the color tests that are still being used also show that the long-hair gene still exists in the breed and – just like black and tan – it means that when 2 dogs are mated and each of them carries a copy of this gene, then 25% of the puppies will statistically be long-haired.

Project Black Broholmer

The black variant of the breed has had a rough time establishing itself in the breed from the very beginning of the reconstruction. Several attempts have been made over the years to try and establish the black



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variant; attempts were made by mating the few existing black dogs with the best black and tan colored dogs who would not otherwise be used for breeding. This step was taken a.o. because the yellow dogs were still few in numbers and because all the yellow dogs approved for breeding were needed for the reconstruction of the yellow Broholmer. Also, a black male black male without pedigree was taken into the breed in order to try and strengthen and maintain the black variant. However, despite these initiatives, the number of black Broholmer dogs decreased.

During recent years, we have tried again to maintain the black Broholmer as part of the breed. The pedigree of the breed is closed, for which reason we cannot accept dogs without pedigree to enter the breed. This means that the few black dogs to be found in the breed should be used with care so that we will also be able to breed black dogs in future.

Contrary to the earlier attempts, we now know that we have 2 kinds of black dogs in the breed. Earlier, it was believed that all black Broholmer dogs were dominant black, but we know now that we also have the more unusual recessive black color variant in the breed. This means that we now know that we can breed black Broholmer dogs in 2 ways: either by mating 2 dogs who both carry recessive black – or by using one dominant black dog.

At this time, we have 5 black male dogs that are approved for breeding; 4 of which are dominant black, and the 5th is recessive black. Two of the dominant black male dogs are from the same litter. Two of the dominant black male dogs have been approved for breeding on exemption granted by DKK; one because of missing HD status and the other because of a missing show result.

As for female dogs, we have as of today one dominant black female dog approved for breeding – she is from the same litter as one of the dominant black male dogs. This female dog has had 2 big litters.

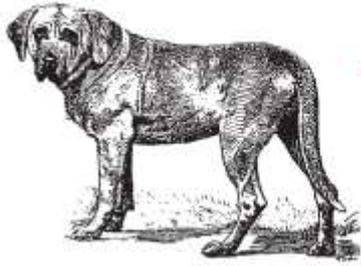
Furthermore, we assume that there are a few sable dogs approved for breeding who carry one copy of recessive black.

Unfortunately, 3 of the dominant black dogs approved for breeding have HD status B and C, and a HD index on the low side. This can make it very difficult to find suitable breeding partners for them as the health must also be taken into consideration.

From 2010 until 2016 incl., 38 black Broholmer dogs were born, of which 4 are recessive black. 12 of the 38 are approved for breeding today, of which one is recessive black. Seven of the 12 approved dogs have been used for breeding and have offspring, amongst which there is one recessive black. Mating has been attempted with a few others without success and the female dogs who have not yet had any offspring are now too old to have their first litter.

In 2017 and 2018, 21 black Broholmer dogs were born; of which one is recessive black. These 21 dogs are divided between 4 litters, of which 2 litters are by the same female dog. Two of the young black dogs are homozygote black, i.e. that no matter who they are mated with, the puppies will always be black.

Unfortunately, some of the black male dogs from these 4 litters are cryptorchids.



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It will be these young black dogs who must carry the black variant into the future together with the present black dogs approved for breeding. We must therefore ensure that all these dogs have their hips and elbows X-rayed, and that they participate in mental descriptions and shows and, preferably, also participate in the exterior description. It is very important that as many of these young dogs as possible are approved for breeding – and that they are also being used in the breeding.

With regards to type, the black variant has not yet developed as much as the sable ones. This makes it difficult for a black Broholmer dog to achieve the same dog show results as the yellow/reds dogs. Sometimes it is more difficult for a black Broholmer to be awarded with a “Very Good” at a show and thereby achieve approval for breeding. The black variant often lacks in height and also lacks mass and substance in the body, and the head and expression are not quite typical, many with somewhat rounded skulls.

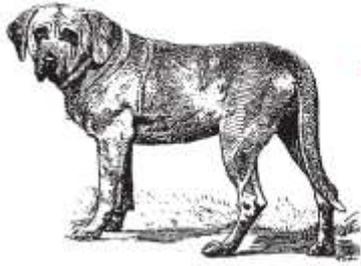
In order to secure the black variant best possible for the future, it is therefore important to use typically yellow and reddish dogs as mating partners to dominant black dogs. This should be seen both as an attempt to improve the type of the black dogs but – equally important – also to spread the gene pool as much as possible so that it will eventually be possible to mate more black dogs with each other without risking too much inbreeding.

CHAPTER 5 - POPULATION

From the moment a studbook is closed, and new breed intakes are no longer accepted, we have established the genetic variation of the breed. What these parent dogs have contributed with genetically, form the genetic variation of the breed, unless the pedigree is re-opened and completely unrelated dogs are accepted again. This means that we cannot increase the genetic variation of a closed breed but, on the other hand, we can reduce the variation over the years. A gene lost is lost forever (Source: The Institute of Canine Biology).

All dogs – and all human beings for that matter – carry a mixture of healthy and unhealthy genes. Therefore, nature is so wisely organized that all genes come in pairs. This means that for every single characteristic as e.g. fur color, diseases, height, and width etc., every individual carry 2 copies of each gene, one from the father and one from the mother. As far as diseases are concerned, this means in case of recessive heredity, that if the individual should have the bad luck of receiving a sick gene from one parent, then there will also be a healthy gene for the same characteristic from the other parent, and thus the individual will not become sick. However, if it is a case of dominant heredity, the individual will become sick even if it carries only one copy of the unhealthy gene. All individuals have thus their very own unique composition of gene pairing, separating the individual from all other individuals in the breed.

This means that every time we reject a dog for breeding, we do not only reject the gene for precisely the characteristic we want to avoid, we also reject the total unique gene composition of the dog – thereby reducing the genetic variation of the breed. The more individuals we reject for breeding, the more the genetic



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variation of the breed will be reduced as the unique gene composition of this specific dog will be lost for good.

On the other hand, every time we accept a dog for breeding, we do not only accept the good characteristics of this dog – we accept the total genetic material of the dog. The more times we use the same dog for breeding, the bigger a footprint this dog will set on the breed and, thereby, we are again reducing the genetic variation of the breed as other dogs therefore not will be used, and therefore not will pass on their unique genetic composition to new generations. It also means that if we use the same breeding combination several times, then we will also reduce the genetic variation of the breed.

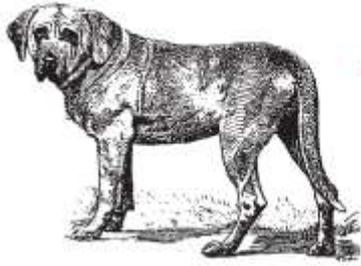
When the genetic variation in a closed gene pool is reduced, it may have some unfortunate consequences. Overall, it means that the breed becomes closer related = bigger inbreeding. With a small genetic variation in a closed gene pool, there is a big risk that a breeding couple both carry the same sick copy of a gene, and then the offspring all of a sudden no longer have a healthy copy to rely on = offspring gets sick = more individuals will be sick from recessive inherited illnesses. Apart from that, it is also known that a small genetic variation in a closed gene pool = big inbreeding in a breed, has a big influence on the immune system of the individuals; and that it also has a big influence on the fertility. Often, this is also causing smaller litters and higher mortality amongst the puppies (Source: The Institute of Canine Biology). All of this is referred to as “Inbreeding Depression”.

5.1 - Popular sire syndrom

In closed populations it often happens that a few male dogs become very popular and therefore they are often used for breeding. This is called Popular Sire Syndrome, and the male dogs mostly used for breeding will very often be those who have performed well e.g. at shows or in tests. But we must remember that all dogs carry both healthy and sick copies of genes which may well be hidden. The more puppies produced by one single male dog, the more copies he will spread of both his healthy and sick genes in the breed. On long terms, this means that many puppies after this male dog potentially will carry the same sick copy of the gene and pass on this sick copy to their own offspring. In this way, the risk of seeing recessive hereditary diseases in a closed gene pool will be increased (Source: The Institute of Canine Biology).

In a gene pool which is already small and fragile like the Broholmer gene pool, this means that in the long term it will be difficult not to breed 2 dogs with the same sick copy of a recessive gene, resulting in a fresh outbreak of recessive hereditary diseases in the breed; and – at first – nobody understands how an otherwise unknown disease is suddenly to be found in the breed.

The fact is, however, that recessive hereditary diseases in a breed do not arise from thin air. They arise because the sick recessive copy of the gene has always been present, and with selective breeding – and especially too much use of the same breeding dogs with consequent narrowing of the genetic variation – the gene will be spread to a large extent in the whole breed.



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5.2 – Popular sire limit in DKK

In order to take care of the health and genetic variation of the breeds, DKK has introduced a Popular Sire Syndrome Limit for all breeds that register more than 100 puppies each year. Popular Sire Syndrome is article 7 in the DKK Ethical Recommendations for Breeding.

The Popular Sire Syndrome Limit per breed is calculated as follows: No male dog should be the father of more than 25% of the average annual number of puppies being registered. DKK calculates the average number for the breed based on the registrations for the last 3 years (Source: DKK Ethical Recommendations, article 7). This means that the Popular Sire Syndrome Limit is not static; it is calculated annually and will change dependent on the number of puppies being registered in the breed. For the Broholmer dog, the Popular Sire Syndrome Limit as per January 01, 2019 was calculated to be 37 – whereas it was 34 in 2018.

The Popular Sire Syndrome Limit can also be calculated in another way: This is called the 5% limit and it is calculated by taking 5% of the total number of puppies born during the breeding-active period of the male dog. The breeding-active period covers the years from the first to the last litter by the male dog. A male dog who spreads the litters over many years will be able to produce more puppies when using this calculation. (Source: <https://webshop.dkk/alle-emner/opdr%C3%A6t/mataoravl>).

The latter calculation method could be used e.g. in case of frozen semen from a deceased male dog.

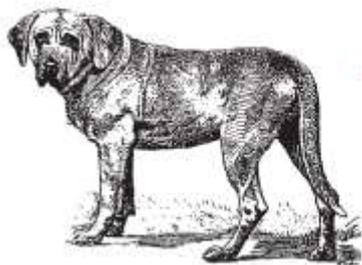
When calculating the Popular Sire Syndrome, DKK can only include dogs who are either bred - and thus in possession of an original DKK pedigree – or born abroad but still registered with DKK.

The Popular Sire Syndrome Limit applies for both male and female dogs, but it is very rare for a female dog to reach the Popular Sire Syndrome Limit for the breed.

With approx. 1,200 live DKK/FCI registered Broholmer dogs throughout the world, the breed is still relatively small when speaking of population biology. All live DKK/FCI registered Broholmer dogs descend from the same few parent dogs irrespective of which country the dog is born in. All DKK/FCI registered Broholmer dogs are still rather closely related and it is still difficult to plan matings without inbreeding if you go 5-7 generations backwards. They are all part of the same small and closed gene pool; therefore, for a breed like the Broholmer dog, it makes most sense to also include the offspring from abroad of a given dog when we talk about Popular Sire Syndrome.

5.3 – Broholmer population

The first X-registered litter of Broholmer puppies was born in 1976 which means that we have now spent approx. 43 years working on the reconstruction.



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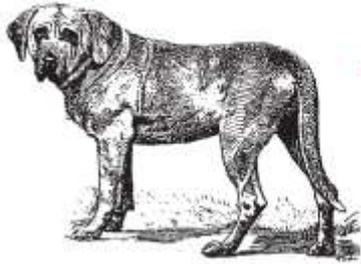
The table below shows the number of registrations in DKK during the last 10 years:

YEAR	No of litters	No of registrations
2007	14	110 (48 males – 62 females)
2008	13	89 (47 males – 42 females)
2009	18	121 (68 males – 53 females)
2010	16	107 (53 males – 54 females)
2011	19	132 (72 males – 60 females)
2012	18	140 (70 males – 70 females)
2013	18	134 (71 males – 63 females)
2014	18	129 (55 males – 74 females)
2015	12	94 (43 males – 51 females)
2016	18	141 (73 males – 68 females)
2017	38	148 (77 males – 71 females)

Furthermore, in the same period, we have registered 49 foreign litters in the database of Broholmerselskabet, but we know that several litters have been born without being registered in the database. All litters born abroad are descendants from Danish Broholmer dogs and thereby they are part of the same closed gene pool as the Danish bred dogs. The dogs born abroad do not contribute with new blood or new genes to the breed.

At the time of writing this report, we have 63 Danish male dogs on the list of male dogs approved for breeding in Broholmerselskabet, and 29 foreign male dogs of which 19 are approved for breeding according to the Danish breeding restrictions for the breed; most of the 19 were approved according to the old Danish breeding restrictions before January 01, 2015.

29 of the Danish male dogs on the list of dogs approved for breeding have at least 1 litter of puppies. Some of the male dogs who do not have puppies have an upcoming planned mating, a few others have been tried for mating without resulting puppies.



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Four of the males on the list of dogs approved for breeding have AD 2; three of the males have been approved for breeding at shows with either VG or Excellent; however, with a later exterior description recommendation stating that it will be difficult to find a suitable breeding partner for them due to missing type. Two male dogs are dead but their semen has been frozen.

The majority of foreign owners of Broholmer dogs do not participate in shows, and their dogs are solely family dogs; thus, the tendency is that foreign dogs are not being judged at an FCI show by one of the Danish judges authorized to carry out exterior approval of the breed at shows. These dogs only obtain the breeding approval required in their country of residence in order to be part of the breeding in their own country.

For the breeding in Denmark, this means that if a Danish breeder wants to use a foreign male, he will often have to apply for exemption from the Danish pedigree rules.

Many breeders in Broholmerselskabet are ordinary families with a female dog that can benefit the development of the breed and thus make 1 or 2 litters with their female, in order to contribute to the development of the breed. It has always been difficult to persuade an inexperienced Broholmer breeder to use a foreign male dog, and now that the young foreign male dogs often do not fulfil the Danish breeding restrictions, it has become even more difficult.

Only one of the 29 foreign male dogs have been used for breeding in Denmark. This dog was approved for breeding before January 01, 2015.

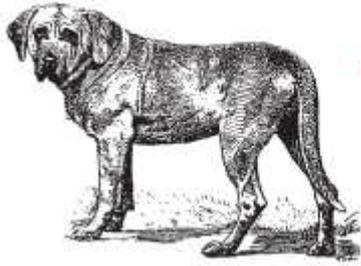
As for female dogs, at the time of writing this report, we have 35 Danish female dogs on the list of approved breeding females, of which 17 have had at least 1 litter of puppies, and the rest is expected to be used for future breeding. Apart from that, we have 16 foreign female dogs, some of which have been approved for breeding according to the Danish breeding restrictions; others are only approved according to the breeding restrictions of their native country. Twelve of the foreign female dogs have had at least 1 litter of puppies. The rest is expected to be used for future breeding.

With the free breeding we have seen an increasing tendency of the Popular Sire Syndrome in the breed and, in connection with this, also more male dogs who have – within a few years - either exceeded their Popular Sire Syndrome Limit or they are very close to the limit.

At the time of writing this report, 2018, the Popular Sire Syndrome Limit for the Broholmer dog in DKK is 34. As per today, two male dogs have exceeded this limit. Apart from exceeding the Popular Sire Syndrome Limit in DKK, both dogs have also been used for breeding abroad.

We also see an increasing tendency of matings being repeated. During the last few years, three matings have been repeated and, furthermore, two male dogs have been used for both mother and daughter.

Exceeding the Popular Sire Syndrome Limit and repeated mating are both issues that will reduce the genetic variation of the breed.



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CHAPTER 6 – RECOMMENDATIONS OF BROHOLMERSELSKABET

When breeding a genetically small breed under reconstruction, we must consider other things than when breeding an old and well-established breed with a broad and solid gene pool. In the section about population it is a.o. noted what negative effect a reduction of the genetic variation in the breed may have in the worst case: Increasing number of recessive hereditary diseases and inbreeding depression.

Almost all breeds have one or more breed-specific diseases or health challenges. Just because of its' size and growing pattern, the Broholmer is pre-disposed for diseases especially related to bones, joints, and cartilage. In the health section we have commented on the diseases in the skeleton that are most often seen in the breed.

Unfortunately, the number of X-ray screenings for HD and AD is decreasing, and also very few breeders and dog owners inform Broholmerselskabet of diseases, and thus it is difficult for us to have a correct and updated picture of the real situation in the breed.

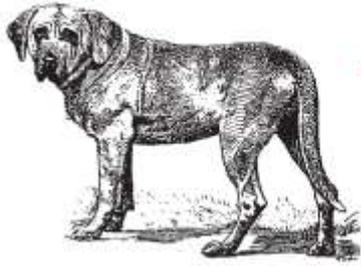
Compared to other gigantic breeds, the Broholmer is generally healthy and well-functioning. In order to uphold this, Broholmerselskabet recommends that the following guidelines are used as much as possible when breeding:

6.1 - Population – Broholmerselskabet recommends

Genetic variation is vital for any closed population and, especially for a small population as the Broholmer, it is even more vital that the breeding first and foremost focuses on spreading and protecting the genetic variation of the breed.

Therefore, the recommendation of Broholmerselskabet is to spread the breeding as much as possible, meaning that:

- There must be very special reasons in favour of repeating a mating – as e.g. to keep a blood line, and then only if the first litter has resulted in exceptionally good adult dogs, and if most of the first litter have been HD/AD X-rayed with a good result.
- Popular Sire Syndrome must be avoided as far as possible, i.e. the foreign offspring of a dog must be taken into consideration when deciding whether a dog may have more litters.
- Inbreeding must still be calculated as 6.25% in 4 generations and not 3 generations which is the DKK minimum recommendation.



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6.2 – Health – Broholmerselskabet recommends

HD/ED:

HD D + E and ED 2 + 3 should preferably not be used in breeding. If there are special conditions in favor of using a dog with HD D/E or ED 2/3, then the breeding partner must be free. Special conditions may e.g. be to keep a blood line in the breed, or a dog with HD A on one hip and HD D on the other hip due to a trauma.

Furthermore, Broholmerselskabet recommends the below mentioned guidelines regarding HD and AD:

- A dog with HD A may be mated with a dog with all HD grades
- A dog with HD B may be mated with a dog with HD A + B.
- A dog with HD C may be mated with a dog with HD A.

- A dog with ED 0 may be mated with a dog with all ED results
- A dog with ED 1 may be mated with a dog with ED 0 + 1.

Just like DKK, Broholmerselskabet also recommends that the total HD index of a mating should be at least 200 at the time of the mating.

OCD:

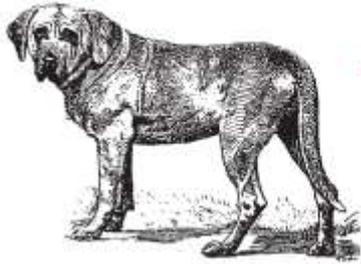
When speaking of OCD, it is mostly a question of OCD in the shoulder joint and it is also the shoulder joint that is being X-rayed during the general OCD X-ray screening.

In an ideal world, a dog with proven OCD in the shoulder should not be used for breeding but when it comes to the Broholmer – a breed with a small gene pool – we cannot yet select that hard, as we also have to consider other parameters in the breed.

Broholmerselskabet recommends that dogs, who have had OCD in the shoulder joint requiring treatment, not should be used for breeding. Treatment could e.g. be operation or conservative treatment in the form of many weeks of strict rest, due to limping.

In Broholmerselskabet, we now and then see dogs being diagnosed with OCD through the general X-ray screening for OCD. Some of these dogs have never had any symptoms of their OCD. Keeping in mind the consideration for the gene pool and knowing that OCD is less hereditary than AD and HD, it may be justifiable to use a dog with OCD but with no symptoms for breeding but always with a free breeding partner. Our advice is that the first litter should be evaluated before producing more litters with the dog in question.

OCD can also be seen in other joints, most often elbow, knee, and hock. The prognosis for a dog with OCD in all other joints than the shoulder is guarded for which reason we strongly advise against using a dog with OCD in elbow, knee, and hocks for breeding.



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SPONDYLOSIS:

As it looks as if there is an increasing number of young Broholmers with spondylosis in varying degrees, Broholmerselskabet has - to begin with - established the below guidelines for using dogs with spondylosis for breeding:

- A dog with grade 4 spondylosis should never be used for breeding.
- A dog with spondylosis grade 2 and 3 may be used for breeding as an exception but must always be mated with a breeding partner free of spondylosis.
- A dog with spondylosis grade 0 and 1 may freely be used for breeding. However, in case of grade 1, it should be checked whether there are known cases of spondylosis with parents/siblings of the breeding partner.

Apart from this, it is our advice that all dogs with parents/siblings with spondylosis grade 2, 3, and 4 should be X-rayed for spondylosis before the dog is used for breeding.

DM:

As mentioned earlier, DM is an exclusion diagnosis which can only be finally concluded by performing an autopsy. Broholmerselskabet has no knowledge of any dogs with a confirmed diagnosis by autopsy.

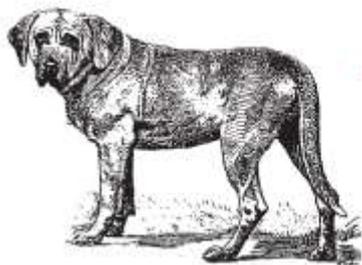
We will follow the development of DM in the breed and also keep our knowledge up to date about the development internationally with regard to gene testing and diagnosing.

Currently, we do not recommend testing Broholmers for DM and using test results as a breeding parameter.

HEART DISEASES

During the final phase of the Heart Project, Copenhagen University (KU) established the below recommendations for the breed regarding aortic stenosis:

It is recommended that all Broholmers get a screening of the heart before being used for breeding, at the earliest when the dog is 12 months old.



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GRADE 0 (Free)	Dogs with aorta low below 2.00 m/S (grade 0) can be used with dogs with grade 0 and grade 1
GRADE 1 (Grey)	Dogs with aorta flow 2.00-2.25 m/s (grade 1) may be used with dogs with grade 0 and grade 1.
GRADE 2 (Mild)	Dogs with aorta flow > 2.25-3.50 m/s (grade 2) should preferably not be used for breeding unless the dog has especially vital characteristics in relation to the reconstruction of the breed. If dogs with grade 2 are being used, this should only be in connection with grade 0.
GRADE 3 (Moderat3)	Dogs with aorta flow > 3.50-4.50 m/s (grade 3) should not be used for breeding.
GRADE 4 (Severe)	Dogs with aorta flow > 4.50 m/s (grade 4) should not be used for breeding.

If other heart diseases are found in connection with a heart scan, it should – according to KU – preferably result in exclusion from breeding.

Broholmerselskabet does of course advise members to follow the recommendations of KU for the breed in order to avoid heart diseases becoming a serious problem with the breed.

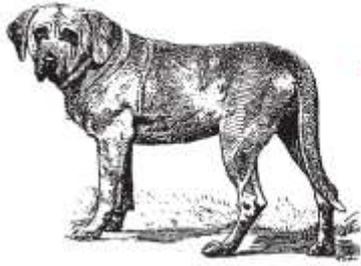
Even though the Project Broholmer Heart is almost finished, KU is still receiving heart certificates and blood tests from Broholmers from all the vets in the EKKO team. We are still working closely together with KU regarding our Broholmer hearts and it is so very important to ensure that all dogs used for breeding must have a screening of the heart.

SKIN:

We have a feeling that allergies and other skin problems exist to a large extent in the breed.

A dog with known allergies and skin problems related to allergy should not be used for breeding. If an adult dog has recurring skin problems, it should not be used for breeding until it has been examined by a vet who is a specialist in skin diseases. If allergy is known in parents/siblings of your breeding dog, it is advised to only use mating partners with no increased occurrence of allergy in the closest family.

Regarding other – especially malignant – skin diseases such as mast cell tumors etc. it must depend on an individual assessment by a vet whether or not to use the dog for breeding. We encourage breeders and dog owners to inform the Breeding Committee in case of malignant skin diseases.



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Broholmerselskabet does of course advise all breeders to follow the DKK Ethical Recommendations for breeding of dogs, Item 4:

“It is the responsibility of the breeder and the owner of the male dog that dogs with hereditary defects are not being used for breeding. Matings that have resulted in puppies with serious defects must not be repeated.”

6.3 – Mentality – Broholmerselskabet recommends

To have a well-functioning dog is the Alpha and Omega. It is of no use that the dog looks beautiful in the show ring if it does not function with the family in their everyday life. In order to also keep the breed mentally sound, Broholmerselskabet advises not to mate two dogs with the same mental weaknesses or two dogs where the same weaknesses or unwanted behavior are seen in the family of both the female and the male.

Nervous and insecure dogs often lack curiosity and often it is difficult for them to abreact. In everyday life, this means that if the dog is frightened by something, it does not have the courage to find out what it was that caused the fright. If, at the same time, the dog cannot forget the fright, it may cause problems for the dog as well as for the owner.

Here the mental description is a good tool, as it shows the instinctive reactions of the dog. Broholmerselskabet advises that breeders should strive to breed dogs with a fair share of curiosity and good abreactions.

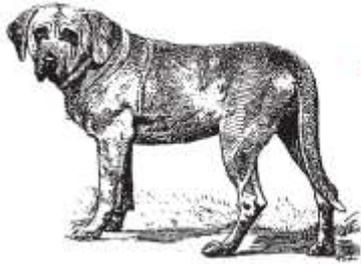
Other than doing the mental description, Broholmerselskabet recommends that you take an active interest in the mentality and behavior of your dog when you make it available for breeding. This advice is of course meant for both breeders and owners of male dogs.

If you are the owner of a dog who is e.g. more active than wished for in the breed, it may be an advantage to check whether this is also the case for parents/siblings from the same litter. If parents/siblings from the same litter have the same disposition, there may be a good deal of heredity involved.

An accomplished mental description is a breeding restriction for the breed; however, Broholmerselskabet advises also to have dogs – who are not meant to be used for breeding – participating in the mental description.

6.7 – Exterior – Broholmerselskabet recommends

As far as the exterior is concerned, Broholmerselskabet recommends that all dogs – and especially all dogs used for breeding – should participate in the exterior description. The dog is examined from end to end and the exterior judge concludes the examination with a description of the dog incl. any matters you ought to



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consider when choosing a breeding partner. It is also advised that in so far as possible you should choose breeding couples that comply with the recommendations of the exterior judge for the individual dog.

Since the type is not yet completely fixed in breed, breed type should be the most important parameter as far as the exterior is concerned. The type is what characterizes the Broholmer dog and distinguishes it from all other breeds; it is what makes the breed special and easy to recognize. The type is e.g. the head and the expression, and the big and heavy body structure with the strong and heavy front

Minor faulty details or weaknesses should not exclude a dog from being used for breeding if the type is otherwise good. A faulty detail may e.g. be a little cow-hockedness, a little too large white markings, a short upper arm or paws that are little too flat. However, when choosing breeding pairs, it should be avoided as far as possible to mate two dogs with the same weaknesses.

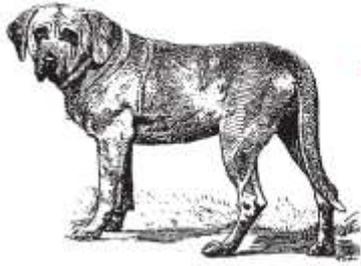
A dog with disqualifying faults should never be used for breeding. For the Broholmer, the below-mentioned faults are disqualifying according to the valid breed standard:

- Squarely build, definitely insufficient in substance
- Nose other than black
- Overshot/undershot mouth
- Eyes of different color
- Erect ears
- Tail curled up
- Coat: Color faulty; long-haired
- Aggressive or overly shy dogs
- Nervous, sharp or aggressive

CHAPTER 7 – THE BREEDING COMMITTEE - COUNSELLING

All members of the Danish Broholmer Society are welcome to seek breeding counselling from the Breeding Committee, and a lot of members use of this opportunity, both Danish and foreign breeders. Owners of male dogs are also allowed to ask for advice from the Breeding Committee regarding the use of their male dog in the breeding.

The Breeding Committee offers counselling in accordance with the DKK restrictions for the breed and according to the recommendations of Broholmerselskabet. This means that inbreeding is calculated on 4th generation and it should not exceed 6.25% in 4th generation. However, we do encourage breeders to consider inbreeding even longer back.



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HD and ED:

Counselling is based on the recommendations of the DKK and Broholmerselskabet that the total HD index of the couple should be 200 when the mating takes place. Furthermore, counselling is based on the below mentions recommendations:

HD D+E and ED 2+3 should preferably not be used for breeding. If there are special conditions in favor of using a dog with HD D/E or ED 2/3, the breeding partner must be completely free. Special conditions may e.g. be to keep a blood line in the breed, or a dog with HD A on one hip and HD D on the other hip due to a trauma.

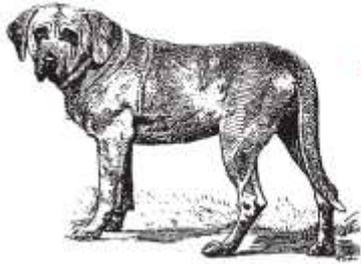
Furthermore, Broholmerselskabet recommends the below guidelines regarding HD and AD:

- *A dog with HD A may be mated with a dog with all grades*
- *A dog with HD B may be mated with a dog with HD A+B.*
- *A dog with HD C may be mated with a dog with HD A.*

- *A dog with ED 0 may be mated with a dog with all grades*
- *A dog with ED 1 may be mated with a dog with ED 0+1.*
-

Apart from restrictions and recommendations, the Breeding Committee always offer counselling based on what is thought to be in the best interest for the breed. The focus here is first and foremost to maintain and increase the genetic variation of the breed which is the reason why the Breeding Committee will always advise against repeating a mating, using the same male dog on 2 litter sisters or vice versa. The Breeding Committee will also advise against one dog – or a handful of male dogs or litters – dominating the breed as this will eventually lead to irreparable damage to the genetic variation of the breed. The Breeding Committee is striving to ensure that as many of the healthy male dogs approved for breeding as possible are in fact being used for breeding so that the breeding is divided between as many healthy male dogs as possible.

All male dogs on the list of approved breeding males are being considered equally in every single case of counselling. Inbreeding is calculated and noted; if the inbreeding is too high compared to the recommendation of DKK and Broholmerselskabet, this is then noted on the dog, and the male is not being considered further in for this female. This does not mean that the breeder cannot choose this dog; it only means that the combination does not comply with the inbreeding recommendation of DKK and Broholmerselskabet. The next step is to calculate the total HD index for the mating, and this is also noted. If the total HD index of the mating is not at least 200, this will be noted on the list that the HD index does not



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comply with the recommendation. In this case, the male dog will still be considered in the further examination as the HD index has no influence on the genetic variation of the breed. Now we will compare the exterior description of the female with that of the male and they have the same weaknesses this will also be noted. Then we move on to mentality. Here we will compare the mental description of the female with that of the male and it will be noted if they share weaknesses. Finally, we will consider the health of the female and her family – and of the male and his family. If e.g. allergy has been reported in both families, this will be noted. If there is an accumulation of cryptorchidism on both sides, this will be noted, etc. When the examination is finished, the document is sent to the breeder and he will then choose the male dog(s) of interest.

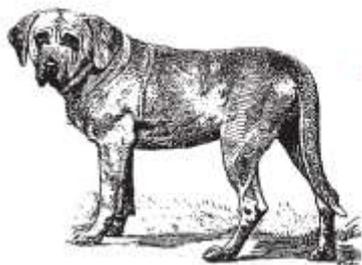
CHAPTER 8 - CONCLUSION

As mentioned earlier, the Broholmer is still a fragile breed on several parameters. The breed still needs us all to consider this fragility – both breeders and all owners of a Broholmer – we all have a joint responsibility for our lovely breed.

The breeding recommendations of Broholmerselskabet have been established by the Breeding Committee in cooperation with DKK geneticist Helle Friis Proschowsky, and even though they are solely to be considered as recommendations, they have been established with an eye on what is best for the breed. Therefore, our advice is to follow the Breeding Recommendations of Broholmerselskabet in the same way as the Ethical Recommendations of DKK.

Spreading the gene pool should still be one of the main goals for all matings. It is important to remember that the matings of today will produce the dogs that are to carry on the breed. It is not beneficial for the development of a genetically small breed that too many dogs in one generation are closely related - which will be the case if matings are repeated – and if a few dogs, especially male dogs, dominate the breed in one generation.

The experience of the Breeding Committee is that it is getting more and more difficult to convince the ordinary dog owner of how important it is for their dog to participate in the mental description, the exterior description, and to have the dog HD/ED X-rayed. Therefore, we are losing important knowledge about the development of the breed. As a breeder, you are therefore a very important person as you should inform your puppy buyers about the importance of these tests – especially, what the tests are used for and the importance of the participation of their particular dog. As a breeder you can establish a good connection with your buyers, follow the development of your puppies and – at the same time – remind the owners of the importance of having their dog doing the tests. Fortunately, many breeders choose to use the supplementary contract of purchase issued by Broholmerselskabet, together with the DKK contract of purchase. Also, there are still breeders who – when selling their puppies – request advance payment for both mental description and exterior description, and sometimes also a deposit for HD/ED X-raying. The advice of Broholmerselskabet



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is, of course, that all breeders should use the supplementary contract of purchase, together with the DKK contract of purchase. It is also advisable that all matings are noted on the list of matings.

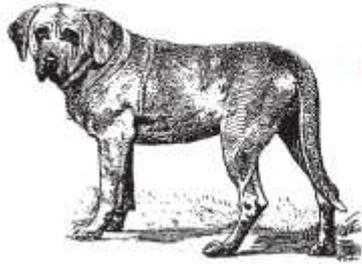
Within the health area, it is the experience of the Breeding Committee that only very few breeders and dog owners inform us when a dog is diagnosed with a disease. In an attempt to be up front with the development within the health area, the Breeding Committee intends to send out a health questionnaire to all owners by the end of the year where the dog is 2 years old, and again when the dog is 4-5 years old, as well as by the end of the year where the dog is 8 years old and being considered a senior. The Breeding Committee can only follow the development of the breed and act upon it, if we are being informed of the health conditions of the dogs.

As an ordinary dog owner, you can also help the breed by remembering to inform the Breeding Committee if your dog is so unlucky to get sick – and especially by letting your dog participate in the mental description, exterior description, and HD/AD X-raying.

The breed belongs to us all, and only by a joint effort will we be able to secure typical, healthy, and well-functioning Broholmer dogs for future generations.



Description	Version	Date	Author
RAS	Version 1	26th March 2019	Broholmerselskabet



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Appendix 1

No. of dogs scanned: 159 + 3 previously diagnosed

	FREE (grade 0)	GREY (Grade 1)	MILD (Grade 3)	MODERATE (Grade 4)	SEVERE (Grade 4)	Unknow grade
No. Of dogs	120	19	14	2	4	3
Murmur	0	4	5	2	4	not known
turbulent blood flow	0	1	3	2	2	not known
supravalvular dilation/ annuloaortisk etaksi	4	1	0	1	0	not known
aortic regurgitation	5	0	3	1	1	not known
macroscopic changes on valve	0	1	0	1	2	not known
axis rotation of the heart	0	1	1	0	0	not known
Aortic insufficiency	2	0	1	0	2	not known
Murmur increased during stress	0	1	0	0	0	not known
Flow increased during stress	0	1	0	0	0	not known
undersized aorta	0	2	0	0	0	not known
pulmonary stenosis	0	1	1	1	1	not known
mitral valve insufficiency	2	0	0	0	0	not known