

Actions already taken by of the NKU kennel clubs and the initial documents regarding the work of the WG

Enclosure 1 part 1/6

Update on actions in the Nordic Kennel Union

May - June 2016

Following a meeting of representatives of the five Scandinavian Kennel Clubs, the Nordic Kennel Union (NKU) has appointed two specific commissions:

- 1) To address situation concerning the health and welfare issues of brachycephalic dogs and to propose strategies. Members of this working group include those from the NKU Scientific Committee, as well as others, e.g. breeders, judges.
- 2) To develop a media strategy.

Meetings are planned to further develop the mandate, structure and goals of these commissions.

Communication / Collaboration with IPFD

Most of the kennel clubs are Founding Partners of IPFD and their staff and experts, e.g. the members of their Scientific Committees, are actively involved in DogWellNet.com and with the International Dog Health Workshops. There has been a special [Brachycephalic Issues section](#) on DogWellNet.com since last fall, and the website is already functioning as an information hub as material and links continue to be added.

IPFD is also in discussions with:

- Veterinary organizations from several countries, Partner and other kennel clubs, welfare organizations and others to determine the potential for a broader international collaboration.
- There will be a stream on issues of exaggerated conformation at the 3rd International Dog Health Workshop in Paris 21-23 April 2017. The French Kennel Club and IPFD are assembling working groups in advance of the workshop.
- IPFD is working with breed experts and breed clubs from several countries to start a database of breeding evaluation and fitness testing programs, breeding strategies and

other information on recommendations and regulations, to serve as a resource for working groups and committees.

- IPFD is also seeking funding to support these international collaborative efforts.
- The section on DogWellNet.com is continuing to expand with information and resources. Plans include presentation of multinational statistics on registration numbers, as well as reviewing current breeding guidelines from various sources.

It is clear that issues of health and welfare in brachycephalic breeds are under scrutiny throughout the world. The most effective way forward is through coordinated international collaboration, sharing of resources, expertise and evaluation of evidence. This collaboration will allow participants to build on the shared efforts and resources to address the issue as appropriate in their own country or region.

Swedish Initiatives

May - June 2016

Following the Swedish Kennel Club (SKK) Symposium on Brachycephalic Dogs in February 2016, the SKK issued a press release describing the background, current and future actions related to brachycephalic_dogs. See [article and press release](#) on DogWellNet.com. Included in that report was a statement on the breeding of brachycephalic dogs and strategies to improve the health status. It was indicated that actions must be taken with cooperation across many stakeholder groups. They indicated that:

“In collaboration with the Swedish Kennel Club and its breed clubs, the Swedish Veterinary Association / the Swedish Society of Veterinary Medicine, the Swedish University of Agricultural Sciences, and the Swedish Board of Agriculture, a number of working groups has been established, aiming to further develop various measures to be taken as soon as possible and at the latest during 2017. “

The Swedish initiatives described above have now been ongoing for a while . All working groups have representatives from multiple stakeholder groups The following working groups have reported progress:

- a) Development of health certificates for puppies of brachycephalic breeds.
 - a. A prototype ready for validation
- b) Development of certificates for proposed breeding stock.
 - a. Under validation

For both a) and b) there will be included definition of parameters, assessment procedures, and education and training of those performing the assessments (e.g. veterinarians).
- c) Epidemiology: compiling quantitative evidence on occurrence, etc. Some sources and initiatives include: insurance data; university hospital data on number and type of cases; requests for data from large animal hospitals and veterinary groups; compilation of registration numbers for various breeds over many years (from SKK); evaluation of the Breed-specific Breeding Strategy documents in use by breed clubs; evaluation of recent breed health surveys, as well as review of the veterinary literature.
- d) Registration of corrective surgeries in brachycephalic breeds. This task is now under the responsibility of the SKK, but being developed in consultation with veterinarians and other stakeholder groups.

- e) Consumer information
- f) Education, including show judges, veterinarians, others.

Other activities:

- The SKK staff and experts are participating with the Nordic Kennel Union initiative (see below).
- Meetings with government, local and regional regulatory agencies, welfare groups. Relationships are going well, as the SKK is able to demonstrate that actions are underway and all relevant stakeholder groups are represented.
- There is a symposium organized for September for veterinarians.

Improving the health of the brachycephalic breeds – information from Finland

January 2017

[General breeding strategy of the Finnish Kennel Club \(FKC\)](#) states the following:

- A dog, which is used for breeding must not display signs of disease or of breathing or mobility difficulties.
- The conformation and appearance of a breeding dog must be free of wellbeing-impairing defects mentioned in the Finnish Kennel Club list of unhealthy characteristics (lately the BSI)

A Nordic BSI was adopted in June 2015.

English Bulldog

Awareness among the breed enthusiasts of the need to improve the health situation of the breed. Particular attention should be focused on its breathing, build and ability to breed naturally.

2011: the breed club initiated a respiratory tract study. The study has revealed various upper respiratory tract problems.

2015-> together with the FKC: health-promotion project:

- A fitness survey in cooperation with the University of Helsinki's Faculty of Veterinary Medicine's Equine and Small Animal Medicine Department. Aims:
 - to review the availability of healthy individuals for breeding by examining skeletal abnormalities (e.g. elbow and hip joints, knees, spine), respiratory tract functions, health of the skin as well as overall fitness.
 - to develop tools for breeding. The first tool is a walking test for all brachycephalic breeds.

Health data being collected via a health survey and a puppy survey to which the club's member breeders are committed to.

The respiratory tract examination is being developed further so that it can be incorporated into the future Bulldog fitness examination and perhaps become an official health examination that affects puppy registration.

FKC Walk test

Discussion event for all breed clubs of brachycephalic breeds in May 2016. The first results of the walking test on Pugs and English Bulldogs were presented by the researchers at the University of Helsinki's Faculty of Veterinary Medicine's Equine and Small Animal Medicine Department. A scientific paper on English Bulldogs has been published (Lilja-Maula et al. 2017).

During the Autumn 2016 and the Spring 2017, French Bulldogs are participating in the study. Also the breed club of the Pekingese is interested in participating.

First FKC walk tests for every brachycephalic breed are being arranged during the Spring 2017. The test is based on the study by Lilja-Maula et al. (2017).

Pug

The breed club initiated [a research project on walking tests](#) few years ago. The club has been very active and is keen on starting walking tests in practice. Passing the walk test will be mandatory for breeding dogs bred by the breed club's accredited breeders as soon as it is possible to arrange tests routinely throughout Finland.

Health and welfare in brachycephalic dogs – NKK

June 2016

Until recently:

Norwegian Kennel Club

- Information/education – owners, breeders, judges etc
- BSI
- Selection for healthy dogs
- Development of fitness test (“tread mill test”) in cooperation with the Norwegian Bulldog Club
- Increased focus on brachycephalic health – meetings with breed clubs and information about brachycephalic health problems and possible actions
- RAS – breed specific strategies – breeding plans for long term goals through a defined strategy in all dog breeds

Norwegian Bulldog Club

- Selection of healthy dogs
- Four health surveys through the last years
- Continuous gathering of health data
- Development of fitness test (“tread mill test”) in cooperation with the Norwegian Kennel Club
- Very specific [health advise on club home page](#)
- RAS for bulldog and French bulldog published and in use

Norwegian Pug Dog Club:

- Selection of healthy dogs
- Ongoing health survey in cooperation with the Vet school
- Education of conformation judges
- Education of breeders

- Questionnaire to veterinarians – difficult because of vet-patient confidentiality
- Close cooperation with the Swedish Pug Club and cooperation with breed clubs for brachycephalic breeds in the Nordic countries – regarding brachycephalic issues
- RAS will be published shortly

Developing plans for possible actions in the (near) future:

- Increased focus on selection for a healthy, functional anatomy and normal function and fitness
- Increased selection for reduced BOAS risk. This may be done by excluding dogs with BOAS, including dogs surgically corrected for the disease, from breeding. This will correspond well to the NKK Code of ethics, saying that only functionally healthy dog may be considered for breeding. At the same time, there should be clearly defined selection for longer muzzles with open nostrils etc in the relevant breeds.
- Work for an adjustment of breed standards, or enhance the description of relevant anatomy in the breed standards. In some of the clearly brachycephalic breeds, there are no accurate description of relative muzzle length in the breed standard (e.g. Pekingese and Staffordshire bull terrier).
- Descriptions that contradict health and welfare should be corrected. In all relevant breeds, the description of the head proportions should describe CFR (craniofacial ratio).
- Endurance/fitness testing (treadmill or outside run) of the individuals to be able to select the dogs with least compromised physical performance.
- Voluntary owner reports (including veterinary journals) of dogs that have undergone respiratory surgery - to a centrally located database
- Veterinary certificate for stud dogs and breeding bitches - on the dog's general health and especially its respiratory function. Reports from sire and dam may become mandatory for registration of puppies.
- Form with owner's statement that the stud dog/breeding bitch has not been surgically corrected for respiratory problems
- Form with owner's statement for the breeding bitch for each litter – stating whether the delivery was normal, assisted (medically/manually) or by cesarean section

Improving the health of the brachycephalic breeds – information from Denmark

January 2017

The Danish Kennel Club hosted a mandatory seminar for all Danish judges in 2012 including a workshop with special emphasis on the conformation of the head.

The Nordic BSI was adopted in Denmark in June 2015. Each day, the dog shows begin with a briefing where the judges are informed about the BSI work.

French and English bulldog

Even though RAS (Racespecifik Avlstrategi – Breed Specific Breeding Strategy) is not mandatory in Denmark,

the Bulldog Club has made RAS for English and French bulldog in 2010. Also in 2010, the breed club hosted a judge- and health seminar with Victor van Raamsdonk from Belgium (French bulldog) and Norman Davies from England (English bulldog).

In 2011, the breed club introduced a voluntary health certificate and at present, results from 150 bulldogs are registered. In 2011 the club held a DNA seminar with professor Ina Pheifer fra Kassel University. After this it was decided to collect DNA profiles for bulldogs as a preparation for future research. In addition, numerous articles in the breed club magazine has been published putting focus on the health issues of the bulldog breeds.

Pug

The pug is included in a common breed club for small companion dogs. The Danish pug breeders are very focussed on health issues; an effort that is supported strongly by the club. The breed club has a show committee which to a great extend only invite judges with thorough knowledge of the brachycephalic breeds to their shows. The judges receive written information material from the club before each show. This material highlights the anatomic features or extreme traits that are unwanted.

Improving the health of the brachycephalic breeds – information from Europe

June 2016

Germany

- Passing a walk test (1000 meters) is mandatory for the breeding dogs in Pugs and Bulldogs (since 2009) as well as French Bulldogs in the VDH (German Kennel Club)
- French Bulldogs and English bulldogs time limit 8 minutes, pugs 12 minutes.
- Only very few dogs do not pass.

The Netherlands

[Requirements for English Bulldogs used for breeding as from June 1, 2014:](#)

1. Breeding Suitability Test: fitness test, patellar luxation (physical exam), physical appearance.

Fitness test: 1000 meter walk in 12 minutes. Recovery time 15 minutes (heart rate and temperature).

2. ECVO eye test

3. DNA test-HUU

4. Restrictions for inbreeding

5. Natural birth, caesarean section

At the moment only about 5% of the dogs do not pass the fitness test. It can be seen that dogs participating in the test have a longer nose and are better breathers compared to the dogs participating in the earlier years.

Austria

- Mandatory health tests:
 - English Bulldog: HD, Patella, Windpipe (trachea) inspection, Eyes
 - Pug: Patella, teeth
 - Pekingese: Heart, patella, PRA

- French Bulldog: Patella
- Recommended:
 - English Bulldog: exercise tolerance test (ETT), skin problems, motion abnormalities, labor difficulties
 - Pug: ETT, dermatitis
 - Pekingese: ETT, dermatitis, teeth, ECVO (Eyes)
 - French Bulldog: ETT, dermatitis, teeth, ECVO
 - ETT mentioned also in Bullmastiff, Dogue de Bordeaux, Norwich/Norfolk, Chow chow, Boston Terrier

United Kingdom

A veterinary assessment for English Bulldogs. As of April 2014, this assessment has a pass or fail - but KC registration of Bulldog pups is not dependent on it.

BOAS meeting was held at the Kennel Club 15.6.2016. In the UK, there are three active research groups working on the BOAS problems in brachycephalic breeds. Researchers were presenting their work at the meeting:

Vet Compass, Dan O'Neill:

VetCompass pulls data from 450 UK vet practices in the search of some epidemiological/demographic trends and facts. Two relevant Vet Compass research papers:

1. Research on upper respiratory tract (URT) disorders, comparing Pugs, French Bulldogs and English Bulldogs to three non-brachycephalic breeds - Border Terrier, West Highland White Terrier and Yorkshire Terrier. Overall across the 6 breeds, 15.8 % of dogs had at least one URT. Pugs, French Bulldogs and English Bulldogs had 22 % and the reference breeds 9.7 %.
2. The most common disorders in Pugs. O'Neill made the point that there may be some issues regarding "normal for the breed" and also how vets categorize respiratory problems. He suggested that BOAS (seen at 5.6 %) probably referred to severe disease to have been categorized as such.

Obesity and corneal ulcers are a large problem in Pugs, but respiratory problems up there at a combined rate of around 15 % (this is a prevalence study and was only looking at Pugs who were diagnosed or treated in 2013).

O'Neill looked at "ways forward":

1) improve the lives of the current population (eg. educate better about obesity/corneal ulcers)

2) improve the lives of future generations

3) reduce the number of brachycephalic dogs via education and/or tackling their representation in advertising & media.

Cambridge University research, Jane Ladlow:

English Bulldogs, French Bulldogs and Pugs all have different (albeit sometimes overlapping) breathing issues and vets need to learn to distinguish between them.

Only 10 % of brachycephalics are Grade 0 (normal). There are at least some good breathers in all three breeds. 70 % of Pugs and 50 % of French Bulldogs have BOAS. Slightly fewer English Bulldogs.

Obesity in Pugs is a big risk factor. Judges are currently actively selecting for dogs that are too fat.

Stenotic nostrils increase the risk of BOAS: 17-fold in French Bulldogs.

English Bulldogs have the best nostrils.

Royal Veterinary College & Bristol University research, Rowena Packer:

The shorter the muzzle, the narrower the nares and the thicker the neck, the bigger the BOAS problem.

There are breed differences (eg. the Affenpinscher has a low risk for BOAS) but still very compelling evidence that dogs with a craniofacial index (CFR) of less than 0.2 are at extremely high risk of BOAS. The average Pug CFR is 0.08 and the Pekingese and the Japanese Chin even lower.

While there is some conformation variability within some breeds which would allow selection away from high-risk BOAS conformation, there isn't much variation in others, for example in Pugs or Pekingese. Almost every Japanese Chin they looked at, for instance, was having BOAS.

The most important conformational risk indicator is relative length of the muzzle.

Aimee Llewellyn, The Kennel Club:

There is a need for vets to be more active in reporting cesarean sections. Currently only 3 % of reports come from vets, and the owners report the rest themselves.

Upcoming in the KC: breed conservational plans (not yet formally announced).

Profligate use of brachycephalic dogs in advertising is a problem and leads to "normalisation" of dogs that are not the best representatives of their breed.

Recent research papers

[Impact of Facial Conformation on Canine Health: Brachycephalic Obstructive Airway Syndrome](#)

Rowena M. A. Packer, Anke Hendricks, Michael S. Tivers, Charlotte C. Burn

Published: October 28, 2015<http://dx.doi.org/10.1371/journal.pone.0137496>

Abstract: The domestic dog may be the most morphologically diverse terrestrial mammalian species known to man; pedigree dogs are artificially selected for extreme aesthetics dictated by formal Breed Standards, and breed-related disorders linked to conformation are ubiquitous and diverse. Brachycephaly—foreshortening of the facial skeleton—is a discrete mutation that has been selected for in many popular dog breeds e.g. the Bulldog, Pug, and French Bulldog. A chronic, debilitating respiratory syndrome, whereby soft tissue blocks the airways, predominantly affects dogs with this conformation, and thus is labelled Brachycephalic Obstructive Airway Syndrome (BOAS). Despite the name of the syndrome, scientific evidence quantitatively linking brachycephaly with BOAS is lacking, but it could aid efforts to select for healthier conformations. Here we show, in (1) an exploratory study of 700 dogs of diverse breeds and conformations, and (2) a confirmatory study of 154 brachycephalic dogs, that **BOAS risk increases sharply in a non-linear manner as relative muzzle length shortens. BOAS only occurred in dogs whose muzzles comprised less than half their cranial lengths. Thicker neck girths also increased BOAS risk in both populations: a risk factor for human sleep apnoea and not previously realised in dogs; and obesity was found to further increase BOAS risk. This study provides evidence that breeding for brachycephaly leads to an increased risk of BOAS in dogs, with risk increasing as the morphology becomes more exaggerated.** As such, dog breeders and buyers should be aware of this risk when selecting dogs, and breeding organisations should actively discourage exaggeration of this high-risk conformation in breed standards and the show ring.

[Impact of Facial Conformation on Canine Health: Corneal Ulceration](#)

Rowena M. A. Packer, Anke Hendricks, Charlotte C. Burn

Published: May 13, 2015<http://dx.doi.org/10.1371/journal.pone.0123827>

Abstract: Concern has arisen in recent years that selection for extreme facial morphology in the domestic dog may be leading to an increased frequency of eye disorders. Corneal ulcers are a common and painful eye problem in domestic dogs that can lead to scarring and/or perforation of the cornea, potentially causing blindness. Exaggerated juvenile-like craniofacial conformations and wide eyes have been suspected as risk factors for corneal ulceration.

This study aimed to quantify the relationship between corneal ulceration risk and conformational factors including relative eyelid aperture width, brachycephalic (short-muzzled) skull shape, the presence of a nasal fold (wrinkle), and exposed eye-white.

A 14 month cross-sectional study of dogs entering a large UK based small animal referral hospital for both corneal ulcers and unrelated disorders was carried out. Dogs were classed as affected if they were diagnosed with a corneal ulcer using fluorescein dye while at the hospital (whether referred for this disorder or not), or if a previous diagnosis of corneal ulcer(s) was documented in the dogs' histories. Of 700 dogs recruited, measured and clinically examined, 31 were affected by corneal ulcers. Most cases were male (71%), small breed dogs (mean± SE weight: 11.4±1.1 kg), with the most commonly diagnosed breed being the Pug. Dogs with nasal folds were nearly five times more likely to be affected by corneal ulcers than those without, and brachycephalic dogs (craniofacial ratio <0.5) were twenty times more likely to be affected than non-brachycephalic dogs. A 10% increase in relative eyelid aperture width more than tripled the ulcer risk. Exposed eye-white was associated with a nearly three times increased risk.

The results demonstrate that artificially selecting for these facial characteristics greatly heightens the risk of corneal ulcers, and such selection should thus be discouraged to improve canine welfare.

BRACHYCEPHALIC SYNDROME (BOAS)

Brachycephalic syndrome (BOAS) is an established cause of respiratory distress in brachycephalic breeds (Wykes 1991, Hendricks 1992, Hobson 1995). Breeds most commonly affected are English and French Bulldogs, Pugs, and Boston Terriers; however, Pekingese, Shih Tzu, King Charles Spaniels, Boxers, Dogue de Bordeaux and Bullmastiffs are also categorized as brachycephalic breeds (Dupré and Heidenreich 2016). See a full FCI list below.

In 2009, the FCI General Committee stated the general clause “Well opened nostrils” to be included in the breed standards for the brachycephalic breeds: Boston Terrier; Boxer; Griffon Belge; Griffon Bruxellois; Petit Brabançon; English Bulldog; Bullmastiff; Dogue de Bordeaux; French Bulldog; Japanese Chin; King Charles Spaniel; Mastiff; Mastino Napoletano; Pekingese; Pug; St Bernard; Staffordshire Bull Terrier and Shih Tzu.

Note: The international organization of cynology, FCI (Fédération Cynologique Internationale) administer the breed standards. These standards, depicted by country of origin/development describes the ideal conformation of each breed and are used by breeders and in particular by show judges when they evaluate dogs at conformation shows.

Definition

Brachycephaly means foreshortening of the facial skeleton and results from a discrete mutation that has been selected for in many popular dog breeds.

The phenotypic expression of the trait is, however, modulated by number of other (at present unknown) genes. BOAS predominantly affects dogs with a brachycephalic conformation (Packer et al. 2015) and can consist of the following features:

- Pinched nostrils (stenosis of the nares)
- Obstruction of the nasal cavity
- Elongated soft palate
- Collapse of larynx or trachea
- Everted laryngeal ventricles.

Dogs have no sweat glands. Instead, their temperature is regulated by means of the upper airways. The constricted airways of the brachycephalic dog breeds are less effective for temperature regulation leaving these breeds more prone to overheating (hyperthermia).

Background

The historical background of exaggerated anatomical features and the initial actions to prevent the unhealthiness caused by them

Selection of exaggerated features in shape, size and colors encouraged recognition of them as fixed breed characteristics. Breed standards written in the past and judges at dog

shows supported this fashion of physical traits, unaware of the negative consequences for the dogs' health and well-being.

Creation of new breeds and re-establishment of old, almost extinct breeds, from just a few founders has happened repeatedly during the last century. This has resulted in too small and functionally isolated populations, in which detrimental genes may be accumulated and then propagated by inbreeding and a too frequent use of few sires, so called "matadors".

At the meeting of the FCI Scientific Commission in Stockholm 1962, professor Hans Jörgen Hansen, at the time also President of the Swedish Kennel Club, presented a paper on The Body Constitution of Dogs and its Importance for the Occurrence of Disease (Hansen 1964).

In 1967, at the world congress organized by World Small Animal Veterinary Association (WSAVA) in Paris, a resolution and detailed presentation was given on breed standards that discouraged exaggerated anatomical features (Anonymous 1969). President of WSAVA at that time was professor Saki Paatsama, at the time also President of the Finnish Kennel Club. The background for this action was a clinical record at the Small Animal Clinic at The Royal Veterinary College in Stockholm (Henricson 1969). This is considered as one of the first cooperative efforts by the FCI and WSAVA and based on Scandinavian joint efforts by cynological organizations and veterinarians. Since then, work within the FCI as well as within the English Kennel Club has resulted in changes in breed standards for several breeds.

More specifically, attention has been paid to breathing problems related to conformation over the years, since the activities in the early sixties. It was boosted when the term BOAS was introduced in the early nineties (Wykes 1991, Hendricks 1992, Hobson 1995). Since then, the attention to BOAS has increased dramatically (Dupré and Heidenreich 2016).

The above mentioned undesired side effects of dog breeding in the past - exaggerated features and the accumulation and propagation of detrimental genes - have been brought to attention by veterinarians and geneticists quite recently from an evolutionary perspective. Unfortunately, it takes a much longer time and greater efforts to repair the damages they have caused.

Animal welfare legislation in the Nordic countries

Regulations on animal welfare are extensive in the Nordic countries and animal protection laws have existed since long. See [Enclosure 2](#).

Breed Specific Instructions to tackle exaggerated features

The basic education of championship show judges in the NKU kennel clubs not only deals with the procedure of judging, knowledge of breed type, judges ethical behavior in the ring and otherwise, but also with dogs' soundness, their welfare, and that they are fit for function. As an example of championship show judges' education in the NKU kennel clubs, see the main points from Sweden and Denmark ([Enclosure 8](#)).

To take the exaggerated features more into account, the NKU prepared in 2012 the document Breed Specific Instructions (BSI), to view exaggerated features in

some pedigree dogs. Dog show judges are requested to pay extra attention to the specific text in the BSI on the breed(s) he/she will judge, as well as to the introduction text for each FCI group.

The Nordic BSI states that all breeds should be able to breathe normally, also when moving. The BSI advises also for further assessment of any respiratory distress symptoms.

Typical features of brachycephalic (short skulled/faced) breeds are expressed in a varying degree in skull, muzzle, jaws, eyes, length of neck and ribcage as well as skin. BSI states that exaggerations in this specific conformation might lead to severe health problems; especially, but not exclusively, referring to breathing and regulation of body temperature.

The BSI states that the main area of risk in the pilot breeds are breathing problems:

- **English Bulldogs:** breathing problems, which could result from overly short muzzle and/or pinched nostrils. More important is, however, the insufficient room in throat and pharyngeal cavities due to excessive amount of loose tissue. Breathing distress is a disqualifying fault.
- **French Bulldogs:** breathing problems which could result from overly short muzzle and neck, as well as pinched nostrils, insufficient room foremost in throat, pharyngeal cavities and/or ribcage.
- **Pugs:** breathing problems due to obesity/overweight, pinched nostrils, narrow respiratory channels with overly short neck, insufficient room in pharyngeal cavities and/or short and open ribcage with short ribs and sternal bone.

Epidemiology of BOAS and the related problems

Published material

Number of published papers on the epidemiology of BOAS is very small. Most published papers on BOAS are case series that do not reflect either the incidence (numbers over time) or prevalence (fraction of) in national breed populations.

O'Neill et al. (2016) reported BOAS in 5,6 % and respiratory noise in additional 3 % of Pugs within their practice based study, that is out of their patients in many clinics, although not the entire population of Pugs in the UK. However, according to O'Neill, BOAS have probably been referred to as severe disease to have been categorized in the study material as such.

Another study by O'Neill et al. (2015) reported a 22 % prevalence of upper respiratory tract (URT) disorders in Pugs, French Bulldogs and English Bulldogs.

The Finnish Pug Club has conducted a study at the Faculty of Veterinary Medicine of the University of Helsinki on the Pugs' respiratory tracts, starting in 2012. The goal of the study was to evaluate the severity of the changes in the upper respiratory tracts through research methods which do not require anaesthesia and which are easy to use and to repeat. An English report can be found in [DogWellNet](#).

Breed club surveys

Sweden: Owners of Pugs in Sweden (2016) reported on respiratory problems in 16 % of their dogs. 8 % of the dogs had had veterinary care for the issue and 6 % had had an operation for BOAS ([Enclosure 4a](#)).

In English Bulldogs it was reported (2013) that 25 % of the dogs had respiratory problems and 11 % of them had veterinary care for the issue ([Enclosure 4b1](#)). See also [Enclosure 4b2](#), a health survey for the English Bulldogs in Sweden during 2005-2006.

Finland: Owners of Pugs, English Bulldogs and French Bulldogs in Finland reported (2016) that 40 %, 22 % and 32 %, respectively, of their dogs had respiratory problems. 2 %, 3 % and 7 %, respectively, had been operated because of those problems ([Enclosure 4c](#)).

Norway: Owners of Pugs in Norway (2016) reported that 48.9 % of their dogs showed signs of breathing issues when stressed, nervous or excited, 23.5 % when walking quickly, and 14.3 % during rest. The most prevalent of other problems were skin (46.4 %) and eye problems (27.5 %; [Enclosure 4d](#)).

The Norwegian Bulldog Club has performed four health surveys (2000, 2006-7, 2011-12, 2015). In French Bulldogs, airway problems were reported in 23.3 % (2011) and 14.6 % (2015) of the dogs. In the 2015 survey, the most prevalent problems in French Bulldogs were skin problems (20.7 %) and ear problems (18.3 %), and for English Bulldogs the most prevalent were eye problems (26.4 %) and skin problems (19.5 %; [Enclosure 4d](#))

Denmark: The summary of results from the Danish Bulldog Club survey during 2011-2013 in the [Enclosure 4e](#).

Insurance data

Insurance data from Sweden rank upper respiratory problems high both in veterinary care and cause of death in English Bulldogs, French Bulldogs and Pugs ([Enclosures 5a-5e](#)). Risk of death in Pugs is 7 times higher and in French bulldog 14 times higher compared to all insured dogs. English Bulldogs, French Bulldogs and Pugs are also at a greater risk for problems with eyes, skin and teeth, all to be related to the brachycephalic constitution.

See also the presentation regarding Agria breed profiles by Dr. Brenda Bonnett at a conference of brachycephalic dogs in February 2016 ([Enclosure 6](#)).

Clinical data

The documentation of dogs operated for BOAS in 2014, 2015 and 2016, consists of data that are currently collected from veterinary clinics in Sweden ([Enclosure 7](#)). The data includes information on the breed, sex, age, weight and origin of the dog, as well as indication for operation, symptoms of the dog, and the procedure. Preliminary data indicate that a wide range of clinics in Sweden, and abroad, perform operations for BOAS on Swedish dogs, and that French Bulldogs and Pugs are the most common breeds operated on.

Also included in the [Enclosure 7](#): a short report from Denmark regarding performed BOAS surgery in the pilot breeds.

References

A list of references is included as [Enclosure 13](#).

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Swedish Initiatives

May - June 2016

Following the Swedish Kennel Club (SKK) Symposium on Brachycephalic Dogs in February 2016, the SKK issued a press release describing the background, current and future actions related to brachycephalic_dogs. See [article and press release](#) on DogWellNet.com. Including in that report was a statement on the breeding of brachycephalic dogs and strategies to improve the health status. It was indicated that actions must be taken with cooperation across many stakeholder groups. They indicated that:

“In collaboration with the Swedish Kennel Club and its breed clubs, the Swedish Veterinary Association / the Swedish Society of Veterinary Medicine, the Swedish University of Agricultural Sciences, and the Swedish Board of Agriculture, a number of working groups has been established, aiming to further develop various measures to be taken as soon as possible and at the latest during 2017. “

The Swedish initiatives described above have now been ongoing for a while . All working groups have representatives from multiple stakeholder groups The following working groups have reported progress:

g) Development of health certificates for puppies of brachycephalic breeds.

a. A prototype ready for validation

h) Development of certificates for proposed breeding stock.

a. Under validation

For both a) and b) there will be included definition of parameters, assessment procedures, and education and training of those performing the assessments (e.g. veterinarians).

i) Epidemiology: compiling quantitative evidence on occurrence, etc. Some sources and initiatives include: insurance data; university hospital data on number and type of cases; requests for data from large animal hospitals and veterinary groups; compilation of registration numbers for various breeds over many years (from SKK); evaluation of the Breed-specific Breeding Strategy documents in use by breed clubs; evaluation of recent breed health surveys, as well as review of the veterinary literature.

j) Registration of corrective surgeries in brachycephalic breeds. This task is now under the responsibility of the SKK, but being developed in consultation with veterinarians and other stakeholder groups.

k) Consumer information

l) Education, including show judges, veterinarians, others.

Other activities:

- The SKK staff and experts are participating with the Nordic Kennel Union initiative (see below).
- Meetings with government, local and regional regulatory agencies, welfare groups. Relationships are going well, as the SKK is able to demonstrate that actions are underway and all relevant stakeholder groups are represented.
- There is a symposium organized for September for veterinarians.

Improving the health of the brachycephalic breeds – information from Finland

January 2017

[General breeding strategy of the Finnish Kennel Club \(FKC\)](#) states the following:

- A dog, which is used for breeding must not display signs of disease or of breathing or mobility difficulties.
- The conformation and appearance of a breeding dog must be free of wellbeing-impairing defects mentioned in the Finnish Kennel Club list of unhealthy characteristics (lately the BSI)

A Nordic BSI was adopted in June 2015.

English Bulldog

Awareness among the breed enthusiasts of the need to improve the health situation of the breed. Particular attention should be focused on its breathing, build and ability to breed naturally.

2011: the breed club initiated a respiratory tract study. The study has revealed various upper respiratory tract problems.

2015-> together with the FKC: health-promotion project:

- A fitness survey in cooperation with the University of Helsinki's Faculty of Veterinary Medicine's Equine and Small Animal Medicine Department. Aims:
 - to review the availability of healthy individuals for breeding by examining skeletal abnormalities (e.g. elbow and hip joints, knees, spine), respiratory tract functions, health of the skin as well as overall fitness.
 - to develop tools for breeding. The first tool is a walking test for all brachycephalic breeds.

Health data being collected via a health survey and a puppy survey to which the club's member breeders are committed to.

The respiratory tract examination is being developed further so that it can be incorporated into the future Bulldog fitness examination and perhaps become an official health examination that affects puppy registration.

FKC Walk test

Discussion event for all breed clubs of brachycephalic breeds in May 2016. The first results of the walking test on Pugs and English Bulldogs were presented by the researchers at the University of Helsinki's Faculty of Veterinary Medicine's Equine and Small Animal Medicine Department. A scientific paper on English Bulldogs has been published (Lilja-Maula et al. 2017).

During the Autumn 2016 and the Spring 2017, French Bulldogs are participating in the study. Also the breed club of the Pekingese is interested in participating.

First FKC walk tests for every brachycephalic breed are being arranged during the Spring 2017. The test is based on the study by Lilja-Maula et al. (2017).

Pug

The breed club initiated [a research project on walking tests](#) few years ago. The club has been very active and is keen on starting walking tests in practice. Passing the walk test will be mandatory for breeding dogs bred by the breed club's accredited breeders as soon as it is possible to arrange tests routinely throughout Finland.

Health and welfare in brachycephalic dogs – NKK

June 2016

Until recently:

Norwegian Kennel Club

- Information/education – owners, breeders, judges etc
- BSI
- Selection for healthy dogs
- Development of fitness test (“tread mill test”) in cooperation with the Norwegian Bulldog Club
- Increased focus on brachycephalic health – meetings with breed clubs and information about brachycephalic health problems and possible actions
- RAS – breed specific strategies – breeding plans for long term goals through a defined strategy in all dog breeds

Norwegian Bulldog Club

- Selection of healthy dogs
- Four health surveys through the last years
- Continuous gathering of health data
- Development of fitness test (“tread mill test”) in cooperation with the Norwegian Kennel Club
- Very specific [health advise on club home page](#)
- RAS for bulldog and French bulldog published and in use

Norwegian Pug Dog Club:

- Selection of healthy dogs
- Ongoing health survey in cooperation with the Vet school
- Education of conformation judges
- Education of breeders

- Questionnaire to veterinarians – difficult because of vet-patient confidentiality
- Close cooperation with the Swedish Pug Club and cooperation with breed clubs for brachycephalic breeds in the Nordic countries – regarding brachycephalic issues
- RAS will be published shortly

Developing plans for possible actions in the (near) future:

- Increased focus on selection for a healthy, functional anatomy and normal function and fitness
- Increased selection for reduced BOAS risk. This may be done by excluding dogs with BOAS, including dogs surgically corrected for the disease, from breeding. This will correspond well to the NKK Code of ethics, saying that only functionally healthy dog may be considered for breeding. At the same time, there should be clearly defined selection for longer muzzles with open nostrils etc in the relevant breeds.
- Work for an adjustment of breed standards, or enhance the description of relevant anatomy in the breed standards. In some of the clearly brachycephalic breeds, there are no accurate description of relative muzzle length in the breed standard (e.g. Pekingese and Staffordshire bull terrier).
- Descriptions that contradict health and welfare should be corrected. In all relevant breeds, the description of the head proportions should describe CFR (craniofacial ratio).
- Endurance/fitness testing (treadmill or outside run) of the individuals to be able to select the dogs with least compromised physical performance.
- Voluntary owner reports (including veterinary journals) of dogs that have undergone respiratory surgery - to a centrally located database
- Veterinary certificate for stud dogs and breeding bitches - on the dog's general health and especially its respiratory function. Reports from sire and dam may become mandatory for registration of puppies.
- Form with owner's statement that the stud dog/breeding bitch has not been surgically corrected for respiratory problems
- Form with owner's statement for the breeding bitch for each litter – stating whether the delivery was normal, assisted (medically/manually) or by cesarean section

Improving the health of the brachycephalic breeds – information from Denmark

January 2017

The Danish Kennel Club hosted a mandatory seminar for all Danish judges in 2012 including a workshop with special emphasis on the conformation of the head.

The Nordic BSI was adopted in Denmark in June 2015. Each day, the dog shows begin with a briefing where the judges are informed about the BSI work.

French and English bulldog

Even though RAS (Racespecifik Avlstrategi – Breed Specific Breeding Strategy) is not mandatory in Denmark,

the Bulldog Club has made RAS for English and French bulldog in 2010. Also in 2010, the breed club hosted a judge- and health seminar with Victor van Raamsdonk from Belgium (French bulldog) and Norman Davies from England (English bulldog).

In 2011, the breed club introduced a voluntary health certificate and at present, results from 150 bulldogs are registered. In 2011 the club held a DNA seminar with professor Ina Pheifer fra Kassel University. After this it was decided to collect DNA profiles for bulldogs as a preparation for future research. In addition, numerous articles in the breed club magazine has been published putting focus on the health issues of the bulldog breeds.

Pug

The pug is included in a common breed club for small companion dogs. The Danish pug breeders are very focussed on health issues; an effort that is supported strongly by the club. The breed club has a show committee which to a great extend only invite judges with thorough knowledge of the brachycephalic breeds to their shows. The judges receive written information material from the club before each show. This material highlights the anatomic features or extreme traits that are unwanted.

Improving the health of the brachycephalic breeds – information from Europe

June 2016

Germany

- Passing a walk test (1000 meters) is mandatory for the breeding dogs in Pugs and Bulldogs (since 2009) as well as French Bulldogs in the VDH (German Kennel Club)
- French Bulldogs and English bulldogs time limit 8 minutes, pugs 12 minutes.
- Only very few dogs do not pass.

The Netherlands

[Requirements for English Bulldogs used for breeding as from June 1, 2014:](#)

1. Breeding Suitability Test: fitness test, patellar luxation (physical exam), physical appearance.

Fitness test: 1000 meter walk in 12 minutes. Recovery time 15 minutes (heart rate and temperature).

2. ECVO eye test

3. DNA test-HUU

4. Restrictions for inbreeding

5. Natural birth, caesarean section

At the moment only about 5% of the dogs do not pass the fitness test. It can be seen that dogs participating in the test have a longer nose and are better breathers compared to the dogs participating in the earlier years.

Austria

- Mandatory health tests:
 - English Bulldog: HD, Patella, Windpipe (trachea) inspection, Eyes
 - Pug: Patella, teeth
 - Pekingese: Heart, patella, PRA

- French Bulldog: Patella
- Recommended:
 - English Bulldog: exercise tolerance test (ETT), skin problems, motion abnormalities, labor difficulties
 - Pug: ETT, dermatitis
 - Pekingese: ETT, dermatitis, teeth, ECVO (Eyes)
 - French Bulldog: ETT, dermatitis, teeth, ECVO
 - ETT mentioned also in Bullmastiff, Dogue de Bordeaux, Norwich/Norfolk, Chow chow, Boston Terrier

United Kingdom

A veterinary assessment for English Bulldogs. As of April 2014, this assessment has a pass or fail - but KC registration of Bulldog pups is not dependent on it.

BOAS meeting was held at the Kennel Club 15.6.2016. In the UK, there are three active research groups working on the BOAS problems in brachycephalic breeds. Researchers were presenting their work at the meeting:

Vet Compass, Dan O'Neill:

VetCompass pulls data from 450 UK vet practices in the search of some epidemiological/demographic trends and facts. Two relevant Vet Compass research papers:

3. Research on upper respiratory tract (URT) disorders, comparing Pugs, French Bulldogs and English Bulldogs to three non-brachycephalic breeds - Border Terrier, West Highland White Terrier and Yorkshire Terrier. Overall across the 6 breeds, 15.8 % of dogs had at least one URT. Pugs, French Bulldogs and English Bulldogs had 22 % and the reference breeds 9.7 %.
4. The most common disorders in Pugs. O'Neill made the point that there may be some issues regarding "normal for the breed" and also how vets categorize respiratory problems. He suggested that BOAS (seen at 5.6 %) probably referred to severe disease to have been categorized as such.

Obesity and corneal ulcers are a large problem in Pugs, but respiratory problems up there at a combined rate of around 15 % (this is a prevalence study and was only looking at Pugs who were diagnosed or treated in 2013).

O'Neill looked at "ways forward":

1) improve the lives of the current population (eg. educate better about obesity/corneal ulcers)

2) improve the lives of future generations

3) reduce the number of brachycephalic dogs via education and/or tackling their representation in advertising & media.

Cambridge University research, Jane Ladlow:

English Bulldogs, French Bulldogs and Pugs all have different (albeit sometimes overlapping) breathing issues and vets need to learn to distinguish between them.

Only 10 % of brachycephalics are Grade 0 (normal). There are at least some good breathers in all three breeds. 70 % of Pugs and 50 % of French Bulldogs have BOAS. Slightly fewer English Bulldogs.

Obesity in Pugs is a big risk factor. Judges are currently actively selecting for dogs that are too fat.

Stenotic nostrils increase the risk of BOAS: 17-fold in French Bulldogs.

English Bulldogs have the best nostrils.

Royal Veterinary College & Bristol University research, Rowena Packer:

The shorter the muzzle, the narrower the nares and the thicker the neck, the bigger the BOAS problem.

There are breed differences (eg. the Affenpinscher has a low risk for BOAS) but still very compelling evidence that dogs with a craniofacial index (CFR) of less than 0.2 are at extremely high risk of BOAS. The average Pug CFR is 0.08 and the Pekingese and the Japanese Chin even lower.

While there is some conformation variability within some breeds which would allow selection away from high-risk BOAS conformation, there isn't much variation in others, for example in Pugs or Pekingese. Almost every Japanese Chin they looked at, for instance, was having BOAS.

The most important conformational risk indicator is relative length of the muzzle.

Aimee Llewellyn, The Kennel Club:

There is a need for vets to be more active in reporting cesarean sections. Currently only 3 % of reports come from vets, and the owners report the rest themselves.

Upcoming in the KC: breed conservational plans (not yet formally announced).

Profligate use of brachycephalic dogs in advertising is a problem and leads to "normalisation" of dogs that are not the best representatives of their breed.

Recent research papers

[Impact of Facial Conformation on Canine Health: Brachycephalic Obstructive Airway Syndrome](#)

Rowena M. A. Packer, Anke Hendricks, Michael S. Tivers, Charlotte C. Burn

Published: October 28, 2015<http://dx.doi.org/10.1371/journal.pone.0137496>

Abstract: The domestic dog may be the most morphologically diverse terrestrial mammalian species known to man; pedigree dogs are artificially selected for extreme aesthetics dictated by formal Breed Standards, and breed-related disorders linked to conformation are ubiquitous and diverse. Brachycephaly—foreshortening of the facial skeleton—is a discrete mutation that has been selected for in many popular dog breeds e.g. the Bulldog, Pug, and French Bulldog. A chronic, debilitating respiratory syndrome, whereby soft tissue blocks the airways, predominantly affects dogs with this conformation, and thus is labelled Brachycephalic Obstructive Airway Syndrome (BOAS). Despite the name of the syndrome, scientific evidence quantitatively linking brachycephaly with BOAS is lacking, but it could aid efforts to select for healthier conformations. Here we show, in (1) an exploratory study of 700 dogs of diverse breeds and conformations, and (2) a confirmatory study of 154 brachycephalic dogs, that **BOAS risk increases sharply in a non-linear manner as relative muzzle length shortens. BOAS only occurred in dogs whose muzzles comprised less than half their cranial lengths. Thicker neck girths also increased BOAS risk in both populations: a risk factor for human sleep apnoea and not previously realised in dogs; and obesity was found to further increase BOAS risk. This study provides evidence that breeding for brachycephaly leads to an increased risk of BOAS in dogs, with risk increasing as the morphology becomes more exaggerated.** As such, dog breeders and buyers should be aware of this risk when selecting dogs, and breeding organisations should actively discourage exaggeration of this high-risk conformation in breed standards and the show ring.

[Impact of Facial Conformation on Canine Health: Corneal Ulceration](#)

Rowena M. A. Packer, Anke Hendricks, Charlotte C. Burn

Published: May 13, 2015<http://dx.doi.org/10.1371/journal.pone.0123827>

Abstract: Concern has arisen in recent years that selection for extreme facial morphology in the domestic dog may be leading to an increased frequency of eye disorders. Corneal ulcers are a common and painful eye problem in domestic dogs that can lead to scarring and/or perforation of the cornea, potentially causing blindness. Exaggerated juvenile-like craniofacial conformations and wide eyes have been suspected as risk factors for corneal ulceration.

This study aimed to quantify the relationship between corneal ulceration risk and conformational factors including relative eyelid aperture width, brachycephalic (short-muzzled) skull shape, the presence of a nasal fold (wrinkle), and exposed eye-white.

A 14 month cross-sectional study of dogs entering a large UK based small animal referral hospital for both corneal ulcers and unrelated disorders was carried out. Dogs were classed as affected if they were diagnosed with a corneal ulcer using fluorescein dye while at the hospital (whether referred for this disorder or not), or if a previous diagnosis of corneal ulcer(s) was documented in the dogs' histories. Of 700 dogs recruited, measured and clinically examined, 31 were affected by corneal ulcers. Most cases were male (71%), small breed dogs (mean± SE weight: 11.4±1.1 kg), with the most commonly diagnosed breed being the Pug. Dogs with nasal folds were nearly five times more likely to be affected by corneal ulcers than those without, and brachycephalic dogs (craniofacial ratio <0.5) were twenty times more likely to be affected than non-brachycephalic dogs. A 10% increase in relative eyelid aperture width more than tripled the ulcer risk. Exposed eye-white was associated with a nearly three times increased risk.

The results demonstrate that artificially selecting for these facial characteristics greatly heightens the risk of corneal ulcers, and such selection should thus be discouraged to improve canine welfare.