



COMMISSIONED PAPER* (PL)

Hereditary oral disorders in pedigree dogs. Proposals for their evidence and assessment.

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SUMMARY

Oral problems which have an hereditary or familial basis as well as those showing breed predispositions were selected for consideration in this paper which follows from a project of the Polish Small Animal Veterinary Association (PSAVA). This project was initiated in response to the growing concern of the veterinary community to the increasing number of hereditary defects within the pedigree animal population. It was felt that a platform facilitating cooperation with the 'kennel clubs' would be very beneficial. The diagnostic criteria for each disease is detailed and a proposed ranking of the negative effect on the quality of life of affected animals is proposed. Forty nine breeds that may have genetic oral disorders are listed and suggestions on how to evaluate and certify affected individuals are described.

Key words: hereditary, oral disease, breed predisposition

This paper was commissioned by FECAVA for The Special issue of EJCAP, Genetic/Hereditary Disease and Breeding.

Introduction

More than 500 genetic defects currently exist in purebred dogs. Inherited diseases such as hip dysplasia, brachycephalic airway syndrome, cardiomyopathies, endocrine dysfunctions, blood disorders, oral problems and many more, affect the quality of life and lifespan of these dogs^[1]. This paper concentrates on the numerous oral problems affecting dogs which have hereditary or familial characteristics or breed predispositions. The basis of inheritance is sometimes associated with a single pair of genes, whilst in others a more complicated mechanism of inheritance is involved. In yet others it is based on observations only leading us to propose there is

a familial basis with the mechanism of inheritance not being exactly understood^[2].

The Feline Advisory Bureau (FAB) proposed a very useful system of dividing hereditary problems in cats (confirmed and suspected) into three groups:

- the genetics of the condition has been confirmed and/or a genetic test is available.
- a breed predisposition is recognised and the condition is strongly suspected to be inherited.
- a potential breed predisposition is recognised but it is not currently known if the condition is inherited or not, (often here only single case reports are available or evidence is anecdotal^[3]).

*The finding and conclusions presented here are based on the report of a Polish Small Animal Veterinary Association project which was published in 2009 (Magazyn Weterynaryjny vol. 18 nr 145'20) by the Dental Working Group of PSAVA. Veterinarians, skilled in the subject, were selected and asked to perform examinations, recording and certifying pedigree dogs which showed no signs or symptoms of oral hereditary problems.

1 address here

The standards of assessment in oral disease should be the same as those pertaining in canine hereditary disorders in other disciplines such as orthopaedics, dermatology, ophthalmology etc. The localisation of the exact genes responsible for specific conditions is often easier in the dog as a map of canine genes has been already made^[4].

Diagnostic methods are shown in Table 1. The degree of the negative influence on the quality of life of animals affected with genetic defects is ranked in Table 2. Forty nine breeds that may have genetic oral disorders are listed and suggestions as to how to evaluate and record the diseases are listed in Table 3.

Table 1 Web based sources of genetic disease information on dogs

Examination and/or recording method		Requirements
Photography Ph		Required photographic documentation of the disease with characteristic signalments
Laboratory	Genetic G	Test must be performed by referral laboratories
	Histopathological H	Test must be performed in referral laboratories
	Other laboratories L	Test must be performed in referral laboratories
Clinical C		Clinical examination according to AVD EVDC AVDC standards
		a. Awaken animal examination
		b. Anesthetised animal examination
Radiography X		Projection and positioning appropriate to problem



Fig. 1 American cocker spaniel with TMJ dysplasia



Fig. 3 English bulldog showing an elongated soft palate (a part of obturative syndrome)



Fig.2 Boxer with a cleft palate



Fig. 4 Bull terrier with a lingually displaced mandibular canine



Fig. 5 Cavalier Eosinophilic granuloma complex



Fig. 6 Dental caries in a Dalmatian

There have been great advances in diagnostic techniques providing many tests that help to confirm the genetic basis of disease. The number of such tests will probably increase every year and thus this, the most reliable basis for diagnosis, will play an increasingly important role. However, the first step in any diagnosis must be a thorough examination of the patient, with particular attention to the specific symptoms and following this considering the differential diagnosis.

For many years the selection process employed with breeding animals concentrated on characteristics such as the appearance only. Health issues were not considered by selection committees. This approach consolidated the presence of certain diseases and defects in the population of pedigree dogs^[5]. Many breeds of dog are drastically different from the appearance of their ancestors. Even some metabolic and immune mediated defects^[6].within the domestic dog population are now considered to have in

hereditary basis and this fact has been totally ignored in breeding selection.

This paper describes PSAVA proposals for an evidence based system to record the occurrence of oral and maxillofacial hereditary defects in a population of pure-bred dogs. These proposals are coordinated by the Board of PSAVA and its Scientific Pedigree Dogs committee and are parallel to PSAVA carried out by other disciplines (ophthalmic, diagnostic imaging, cardiology, etc.) The Dental working group of PSAVA developed a list which includes 49 breeds, among which examples of both single and multiple defects can be found. Each specific disease or problem related to the breed is referred to in the literature. The diagnosis of a particular disease is based on precise criteria such as clinical assesment, imaging and laboratory tests (histopathology and/or genetic). Documentation of registered diseases should be either photographic or radiographic. In addition, each problem was evaluated in terms of its negative influence on the health and vital functions of the animal. This 'negative score' was shown in a scale of 1-3 with 1 being the lowest and 3 the highest level of deleterious effect (Table 2).

Table 2

Ranking	Clinical importance
1	Low and moderate effect on life quality. Treatment not always necessary
2	Significant influence on life comfort and quality. Mandatory treatment.
3	Critical influence on Health. Mandatory treatment, in severe cases the likely consideration of euthanasia.

The clinical evaluation in addition to the certification process is shown in the form on the next page. This is carried out by veterinarians who meet specific requirements established by the PSAVA Board of Hereditary Problems Certification. Breeders or pet owners who are interested in subjecting their dogs to the test will receive a certificate describing the presence or absence of specific genetic problems in the assessed individual.

The final decision as to how the results of this certification test can be used in the context of selective breeding of pedigree dogs is made independently by the Polish Kennel Club.

CANINE ORAL AND MAXILLOFACIAL ASSESMENT CHART



Date of examination <i>13.01.2009</i>		Number <i>001/2009</i>		
Owner	<i>Grażyna Gawor, Kraków ul. Chłopska 2a</i>			
Dog	Full name	<i>Chelsea, Momot</i>		
	Sex <i>samica</i>	Date of birth <i>22.04.2005</i>		
	ID	<i>MC 1272647973247</i>		
	Breed	<i>Boxer</i>		
	Umaszczenie Kennel club Oral treatment	<i>żółta</i> <i>Małopolski</i> <i>Gingivectomy/gingivoplasty</i>		
Breed predispositions	<i>Supernumerary teeth</i>	<i>Cleft palate</i>	<i>Gingival hyperplasia</i>	<i>Retained teeth</i> <i>Dentigerous cyst</i>
Clinical assesment	<i>SN 102</i>	<i>Not found</i>	<i>Pseudopockets</i>	<i>Missing 305</i>
Radiographic evaluation	<i>Fused tooth</i>			<i>DTC 305</i>
Laboratory results			<i>Histopathology: gingival hyperplasia</i>	
Photographic documentation	<i>yes</i>		<i>yes</i>	<i>yes</i>
Ranking	1	0	1	2
Total	4			

Authorised Veterinary Surgeon: *Jerzy Gawor*

CANINE ORAL AND MAXILLOFACIAL ASSESMENT CHART

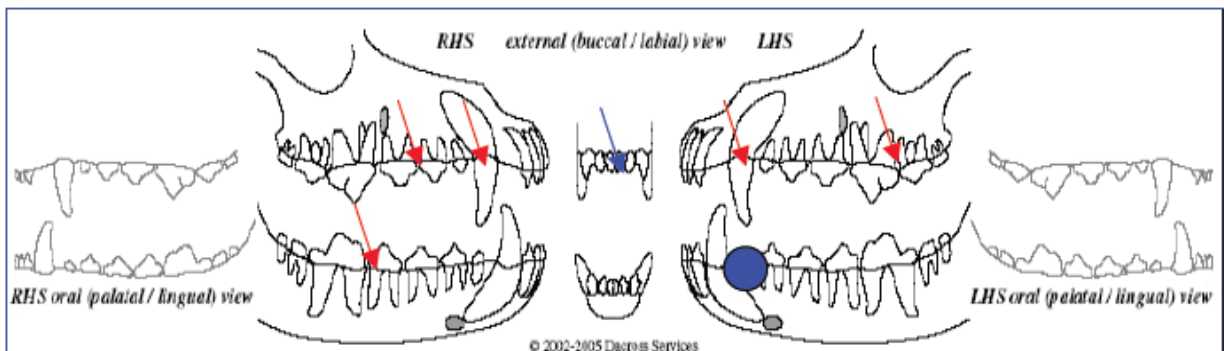


Appendix to oral assesment:

Scull type: **brachycephalic**/ mesocephalic/ dolichocephalic;



Occlusion: normocclusion, **Class I:** anterior cross-bite/ posterior cross-bite/ linguoversion, mesioversion/teeth crowding/ rotated teeth **Class II:** mandibular distoclusion/ prognathia/ wry bite/ **Klasa III **progenia****/ retrognathia wry bite/level bite. **Class IV** – wry bite
Open occlusion./traumatic occlusion



Authorised Veterinary Surgeon *Jerzy Gawor*



Fig. 7 Great Dane with gingival hyperplasia



Fig. 9 Longhaired dachshund showing Retrogenia



Fig. 8. Oligodontia in a chinese crested dog



Fig. 10 Standard poodle showing enamel hypoplasia

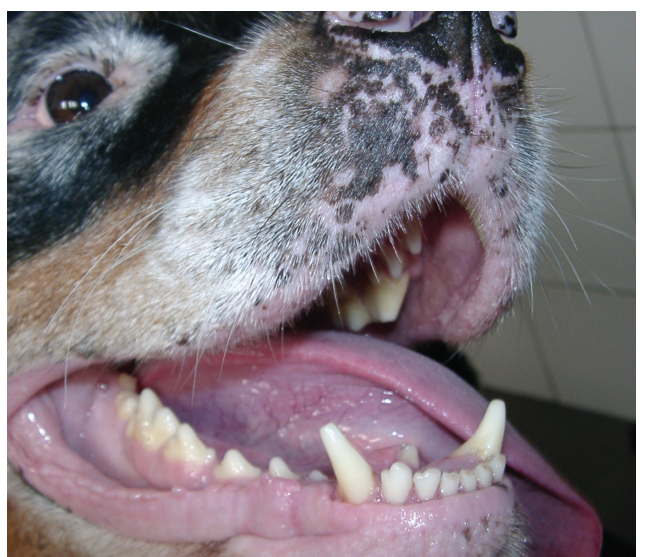


Fig. 11 Rottweiler vitiligo

Some of the listed problems such as Cranio-Mandibular Osteopathy or UV syndrome [7,8] are not located exclusively in the mouth but all of them affect oral health and/or function. Other problems such as gingival hyperplasia or supernumerary teeth [9,10] are 'just dental' but also influence general health. There are few problems of

a systemic nature which have a strong influence on the oral cavity (eg. von Willebrand disease [11]) especially when oral surgery or dental procedures are performed. Certain anatomical anomalies have shown a tendency to be inherited, and also occur more frequently in certain breeds (for example gingival hyperplasia in Boxers or



Fig. 12 Shar pei with the 'Tight lip' syndrome

retrogenia [Receding lower jaw and/or mandibular distocclusion] in Longhaired Dachshunds [12,13]).

Some of the described problems may appear controversial because there is no proof of their hereditary origin, but clinical observations in the population of a particular breed indicate their strong tendency to appear to be inherited. An example of this is persistent primary dentition in the Yorkshire terrier. Historically, the anomaly which was considered most frequently as being hereditary and for which a genetic factor exists which can be selected against in breeding, is the cleft palate [15]. Among oral problems, there are diseases that slightly affect quality of life but carry a potential risk of serious complications developing if neglected, not treated or not treated properly. Examples are retained, impacted, or missing teeth. Disorders of tooth eruption may be of two types: a generalised disorder such as delayed eruption in Tibetan terrier [14] or a more local one such as impaction of the first mandibular premolar followed by formation of odontogenic cysts as occurs in the Shi-tzu and brachycephalic dogs [15].

In this study, there are no specific clinical descriptions of disease entities, but these can be seen in the illustrations which show the selected most important symptoms. The PSAVA proposal will help address the growing problem of the presence genetic defects in the pedigree animal pool.

Veterinarians and pet owners often feel that purchasing a 'pedigree' dog is tantamount to a warranty that the animal is free from defects and serious diseases. In fact such a warranty cannot be provided even with the best control system. The existing selection criteria leave many

opportunities for the introduction of individuals into reproductive pool that will then pass on negative traits to their offspring. Current knowledge allows us to determine which defects are indisputably dangerous to life and compromise the health of the dog and which others at the moment seem to be less important to quality of life [16,17,18].

It is important to add to the list some conditions which seems to be just 'cosmetic' but which may in fact seriously affect health or have other severe consequences [19].

For many years, veterinarians have attempted to increase the control of hereditary diseases in pedigree dogs [20,21,22]. These efforts are well articulated in the recommendations for Kennel Clubs and the professional media. Specific recommendations can be found in Finland, Norway, Canada and The Netherlands [23,24,26,26]. Additionally, in 2004 in Greece (Rhodes) at the FECAVA European Congress, the subject of the FECAVA symposium was congenital defects and diseases [27,28,29].

In order to help in the diagnosis of hereditary diseases a selection of diagnostic methods is suggested (Table 1.) A useful method of recording the results is described in Table 3 alongside each condition.

The examination must be carried out by an authorised veterinary surgeon, licensed for that purpose. It must follow the agreed protocol which will be specific to the breed and condition as will the certificate issued if the animal is approved. In Poland competent Veterinary surgeons are authorized by a Committee of the PSAVA. Authorization has to be verified regularly and attention is paid to the Veterinary surgeon's CPD and CE record. More information is available on <http://www.pslwmz.org.pl/index.php/stomatologia> This website allows translation in English.

For all conditions examined a score of 1-3 points (Table.2) is given. One point indicates a low level of affect on the quality of life. Treatment is not always necessary. Two points are assigned to animals with more serious problems whilst 3 points would result in the animal being disqualified from breeding because of the severe effect of the condition on the health, functionality and quality of life of the dog. Points can be given for more than one condition in an animal, for example boxer affected by gingival hyperplasia, supernumerary dentition and dentigerous

cysts each only giving one or two points but resulting in a total collect of 4 points. When the total number of points collected during evaluation of the animal exceeds 3, this fact should also be treated as the presence of eliminating fault.

At the moment very few health problems have a significant impact on the decision as to whether or not to allow an individual to reproduce. Dental problems which are taken into account are the number of teeth and malocclusion^[30]. Many other important anatomical and metabolic disorders or abnormalities are ignored.

One must assume that this situation will result in a growing number of dental disorders in pure-bred dogs. Table 3 shows in which breeds dental problems are most frequently found.

All of these conditions should be treated to remove or at least palliate the condition. The aim is to limit the ability of affected animals from spreading the problem within breed.

Most conditions can be successfully treated, although it can sometimes be time consuming and expensive. An animal which receives a certificate confirming the absence of diseases that can be inherited can be declared to have: No evidence of oral and maxillofacial genetic, hereditary or breed predisposition diseases. A copy of the certificate can be seen in the dental section of www.pslwmz.org.pl

The list of conditions, standards of assessment and other methodology will be reviewed every year by the Project Management Board of PSAVA .



Fig. 13 Sheltie with lance teeth

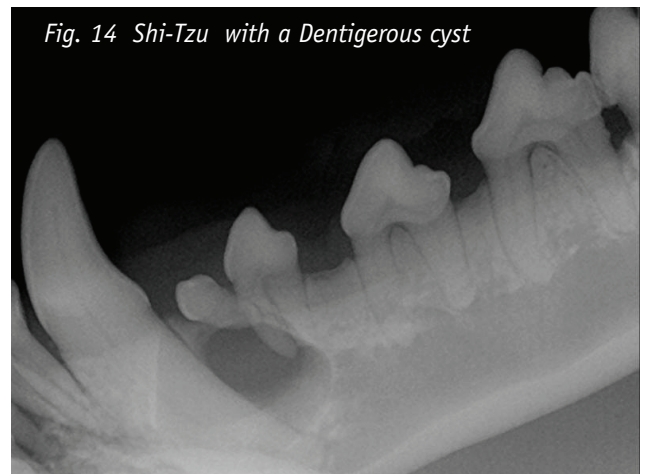


Fig. 14 Shi-Tzu with a Dentigerous cyst

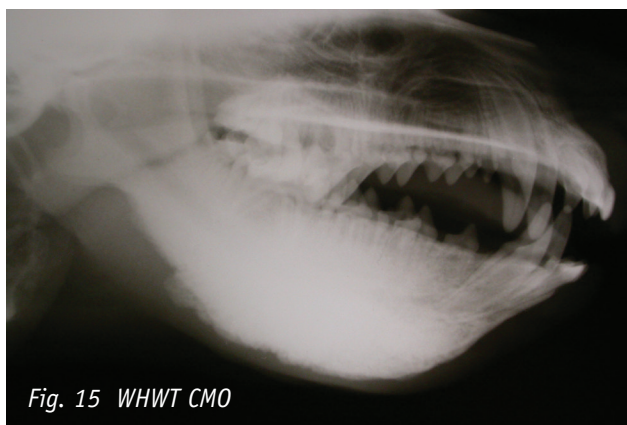


Fig. 15 WHWT CMO



Fig. 17 Plaque associated stomatitis



Fig. 16 Persistent deciduous teeth

Table3 List of breeds and the problems associated with these breeds, together with the required diagnostic methods and ranking of clinical importance The Abbreviations used can be seen at the end of this paper before the references

Breed	Required diagnostic method and record	Problem	Ranking of clinical importance Tab1
Akita inu	C, Ph	Uveodermatologic syndrome (UV-syndrome)	3
	X	TMJ dysplasia; open mouth locking	2
American cocker spaniel	X	TMJ dysplasia; open mouth locking (Fig.1)	2
Basset hound	X	TMJ dysplasia; open mouth locking	2
St. Bernard	C, Ph	Cheilitis due to macrocheilia	1
	C, Ph	Cleft tongue, Bifid tongue	3
Boxer	C, X	Supernumerary teeth,	1
	C, Ph	Cleft palate (Fig.2)	3
	C, Ph	Gingival hyperplasia	1
	C, X	Retained teeth	2
	X	Dentigerous cyst	2
Brittany Spaniel	C, Ph	Cleft palate	3
Boston terrier	C, Ph	Elongated soft palate	2
English bulldog	C, Ph	Elongated soft palate (Fig. 3)	2
	C, Ph	Supernumerary teeth,	1
	C, Ph	Wry mouth	2
French bulldog	C, Ph	Elongated soft palate	2
	C, X	Teeth overcrowding	1
Bull terrier	C, Ph	Lingually displaced Canines, Narrow-base canines(Fig.4)	1
Bullmastif	C, X	Idiopathic calvariar hyperostosis	2
Cairn terrier	X, H	Cranio-mandibular osteopathy (CMO)	3
Cavalier King Charles spaniel	C, Ph, H	Plaque associated stomatitis	2
	C, Ph	Lip fold dermatitis	1
	X	TMJ dysplasia; open mouth locking	3
	C, Ph H	Oral form of the Eosinophilic granuloma complex (Fig.5)	2
Italia Greyhound	C, R	Lance teeth	2
English Cocker spaniel	C, Ph	Lip fold dermatitis	1
	X	Abnormalities in skull development	2
Collie	L	Grey Collie syndrome,	3
	C, X	Lance teeth	2
	C, H	Gingival hyperplasia	1
Dalmation	C, X	Caries (Fig.6)	1
	C, H	Gingival hyperplasia	1
Doberman	G	v. Willebrand's disease	3
	C, H	Gingival hyperplasia	1
Great Dane	C, H	Gingival hyperplasia (Fig.7)	1
Dogue de Bordeaux (Bordeaux Mastiff)	C, H	Gingival hyperplasia	1
Chinese crested dog	C, X	Oligodontia (Fig. 8a and 8b)	2
Longhaired Dachshund	C, X	Lance teeth	2
	C, Ph	Retrogenia (Fig .90	2
	C, Ph	Lingually displaced Canines, Narrow-base canines	2
Shorthaired Dachshund	C, X	Lance teeth	2
	C, Ph, X	Lingually displaced Canines, Narrow-base canines	2
	C, Ph, X	Periodontopathy of the palatal aspect in maxillary cuspids	1
Kerry blue terrier	C, X	Oligodontia	1

Table3 Continued ...

Breed	Required diagnostic method and record	Problem	Ranking of clinical importance Tab1
Labrador retriever	X	TMJ dysplasia; open mouth locking	3
Lhasa apso	C, X	Teeth overcrowding	1
	C, X	Retained teeth	2
	X	Dentigerous cyst	2
Maltese terrier	C, Ph, H	Chronic Ulcerative Periodontitis/Stomatitis(CUPS)	2
Pug	C, Ph	Elongated soft palate	2
Anatolian shepherd	C, Ph	Ankyloglossia(tongue tie)	1
German shepherd	C, Ph	Retrogenia	2
	C, Ph	Lingually displaced Canines, Narrow-base canines	2
	L	Masticatory Muscle Myositis MMM	3
Tervuren	C, Ph	Vitiligo (loss of colour)	1
Pointer	C, Ph	Retrogenia	2
Standard Poodle	C, Ph, X	Periodontopathy of the palatal aspect in maxillary cuspids	1
	C, X, Ph	Hypoplasia of the enamel(Fig.10)	2
Rottweiler	C, Ph	Vitiligo(Fig.11)	1
	L	Masticatory muscle myositis (MMM)	2
Samoyed	C, L	Uveodermatologic syndrome (UV-syndrome)	3
Irish Setter	C, X	Supernumerary teeth,	1
	C, Ph	Lip fold dermatitis	1
	C, X	TMJ dysplasia; open mouth locking	3
Shar-pei	C, Ph	'Tight lip' syndrome(Fig .12)	2
	C, Ph	Retrogenia	2
	C, Ph	Lingually displaced Canines, Narrow-base canines	2
Sheltie	C, X	Lance teeth (Fig.13)	2
Shi-tzu	X	Dentigerous cyst (Fig.14)	2
	C, X	Teeth overcrowding	1
	C, X	Periodontal disease	1
Springer spaniel	C, Ph	Lip fold dermatitis	1
	C, X	TMJ dysplasia; open mouth locking	3
Syberian husky	C, Ph, H	Plaque associated stomatitis	1
	C, L	Uveodermatologic syndrome; (UV-syndrome)	3
	C, H	Eosinophilic granuloma complex with oral expression	2
Schnautzer	C, Ph	Microcheilia (swollen lips)	2
Miniature Schnautzer	C, Ph	Microcheilia	2
	G	Myotonia congenita.	3
Tibetan terrier	C, X	Delayed teeth eruption	2
Scottish terrier	X, H	Craniomandibular osteopathy (CMO)	3
	C, Ph, H	Plaque associated stomatitis	1
Weimeraner	X	TMJ dysplasia; open mouth locking	3
West highland white terrier	X, H	Craniomandibular osteopathy (CMO) (Fig. 15)	3
Wheaton terrier	C, Ph	Delayed teeth eruption	2
Yorkshire terrier	C, X	Persistent deciduous teeth (Fig .16)	2
	C, Ph	Teeth crowding	1
	C, Ph, H	Plaque associated stomatitis (Fig .17)	1

Abbreviations

- Ph Photographic documentation is performed to record the symptoms of the disease, which are considered pathognomic or typical for a particular disease.
- G Genetic testing at the moment does not apply to certain diseases simply because there is no commercial test available as yet (though it is likely that a test may appear test for CMO). If there is no test available, another of the diagnostic criteria must be fulfilled (for example in the case of CMO this would be radiological and histopathological examination) ^[34].
- H Histopathological examination should be performed in referral laboratories, the evaluation being undertaken by qualified veterinary pathologists ^[35].
- L Laboratory testing refers to a number of diseases listed in Table 3. (Laboratory tests do not embrace genetic tests in the context of this paper)
- C Clinical assessments are those which follow the standards of EVDC, AVDC or AVD. These include the physical assessment of the oral cavity, bite, periodontium, dentition and mucous membranes. The documentation of such a study should follow a standard protocol of oral examination and photography. Photographs should be taken of any specific features of the problem and should always be correctly positioned and of good quality and magnification ^[36].
- X Radiographic examination must be carried out according to standard rules and using appropriate imaging equipment and positioning. Image represents diagnostic value based on its resolution, contrast and projection^[37].

It will be possible to introduce additional evaluation criteria and new problems which arise if they are considered hereditary.

The aim is to encourage breeders to participate in the project on voluntary basis. Hopefully some Kennel Clubs may be prepared to accept that mandatory controls are needed for some conditions in some breeds. This PSAVA dentistry project will hopefully pioneer a new approach to selective breeding enhancing the quality of life of our pets.

The results of the oral assessment protocol will be archived by the veterinarian, a copy being given to the pet owner as well as to the Project Management Board of PSAVA. The age of the animal being evaluated will depend on the problem and breed concerned but in general the aim is to perform this assessment twice at the age of 6 and 14 months in all breeds.

Efforts have been made for many years in the past to control the degenerative diseases of the elbow and hip and these have faced many barriers and constraints from both veterinarians and breeders. Both mentioned diseases cause very serious defects that threaten the normal functionality of the affected pet ^[31,32,33]. PSAVA hopes that, in agreement with the Kennel Club, breeders will be encouraged to work together to improve the dental health of dogs and control of inherited diseases in the pure-bred dog population. The proposals outlined in this paper could become the basis of further general discussion of inherited disease which, in the author's opinion, would be very worthwhile.

These Abbreviations are also used in the tables:

- AVD - Academy of Veterinary Dentistry
AVDC - American Veterinary Dental College
CMO - Craniomandibular osteopathy
CUPS - Chronic Ulcerative Periodontitis/Stomatitis
EGC - Eosinophilic Granuloma Complex
EVDC - European Veterinary Dental College
FAB - Feline Advisory Bureau
FCI - Fédération Cynologique Internationale
MMM - Muscle Masticatory Myositis
PSAVA - Polish Small Animal Veterinary Association
TMJ - Temporo mandibular joint
UV-syndrome - Uveodermatologic Syndrome

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