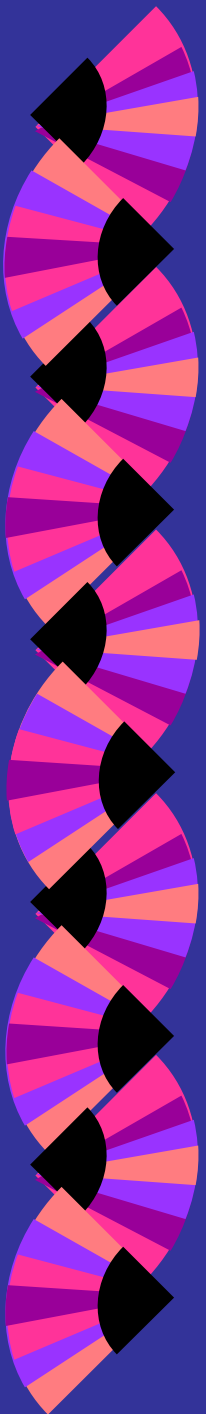


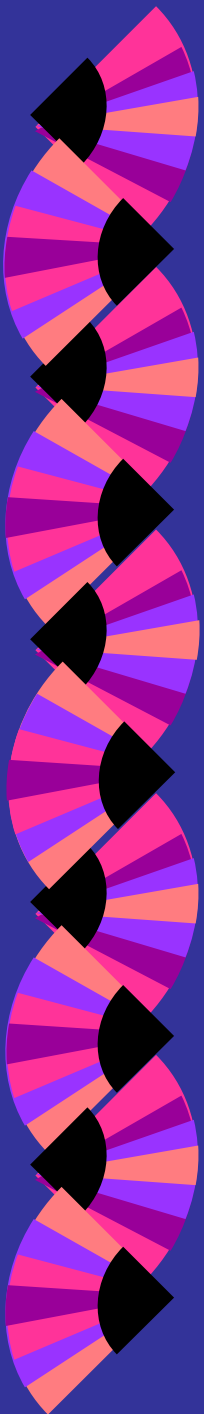
A Genetic Overview of the French Bulldog



Jerold S Bell, DVM

Tufts Cummings School of Veterinary Medicine

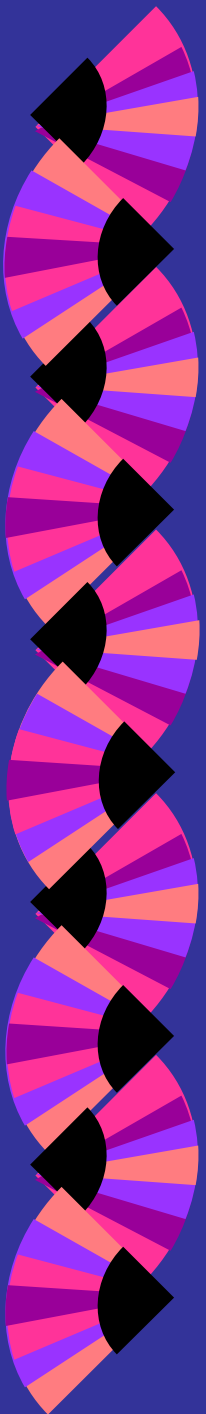
Practical Genetics for French Bulldog Breeders & Owners



Jerold S Bell, DVM

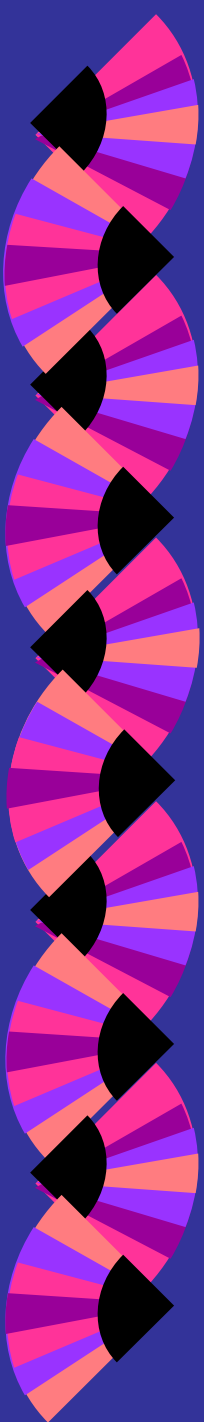
Tufts Cummings School of Veterinary Medicine

Pedigree Structure of the French Bulldog



AKC Population Growth

<u>Year</u>	<u>AKC Rank</u>	<u># of dogs registered</u>
2008	26	6,963
2007	34	6,399
2006	36	5,509
2005	38	4,210
2004	49	3,377
2003	54	2,202
2002	58	1,840
2001	64	1,727
2000	71	1,513
1999	73	1,278
1998	76	1,227
1997	76	1,269
1996	82	1,093
1995	81	1,039
-		
1990	81	632
-		
1985	94	318



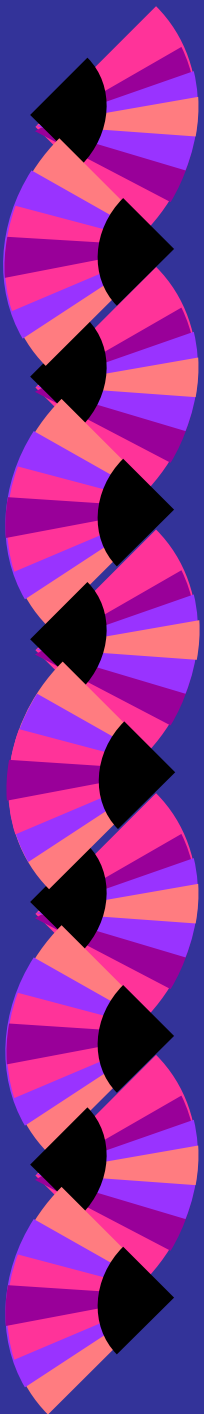


The Ins and Outs of Pedigree Analysis, Genetic Diversity, and Genetic Disease Control

www.mbfsc.com/compupe/bell.asp

Types of Matings

- ◆ Inbreeding: Breeding closely related dogs.
- ◆ Linebreeding: Less intense form of inbreeding. Concentrating the genes of a particular ancestor.
- ◆ Outbreeding: Breeding dogs less related than the average of the population.
- ◆ Crossbreeding: Breeding two different breeds together.



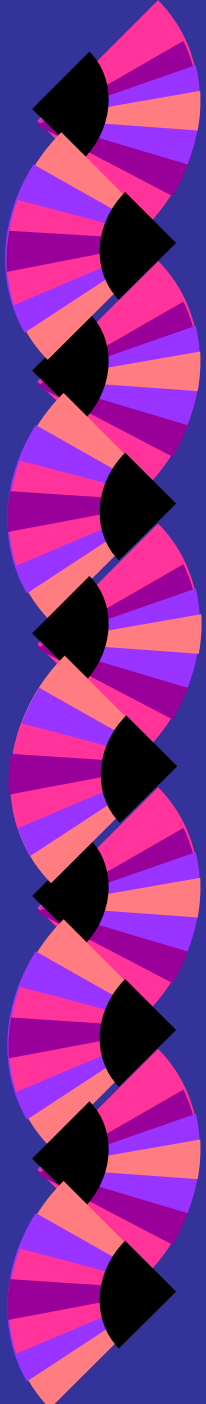
Pure-bred



Designer breed



Random-bred





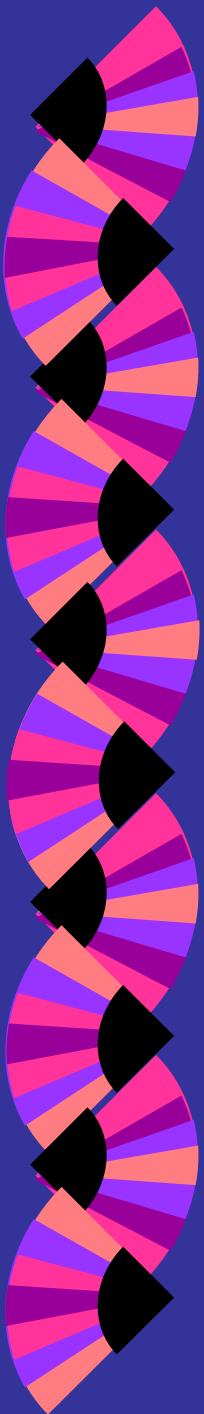
Inbreeding Coefficient

(Wright's Coefficient = F_x)

- ◆ The proportion of all variable gene pairs that are likely to be homozygous due to inheritance from ancestors *common* to the sire and dam.
- ◆ The probability of an individual being homozygous at a given gene pair for a gene received from an ancestor *common* to the sire and dam.

Relationship Coefficient

- ◆ A measurement of the probable genetic likeness between the individual and a particular ancestor
- ◆ The probable percentage of genes the individual and the ancestor have in common from descent
- ◆ Can be approximated by % blood calculation





French Bulldog Inbreeding Coefficients Over Time

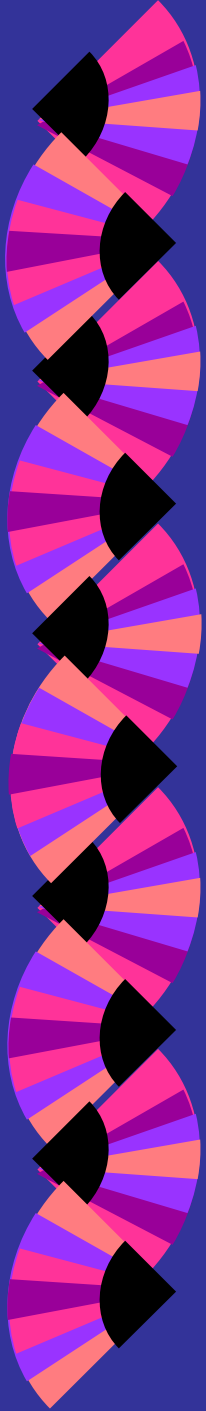
<u>Period</u>	<u>Average 10 generation coefficient</u>	
Through 1979	34.88%	+/- 16.35
1980-1984	25.59%	+/- 13.20
1985-1989	19.54%	+/- 8.84
1990-1994	17.76%	+/- 6.95
1995-1999	16.00%	+/- 6.89
2000-2004	13.42%	+/- 6.35
2005-2009	11.07%	+/- 6.00



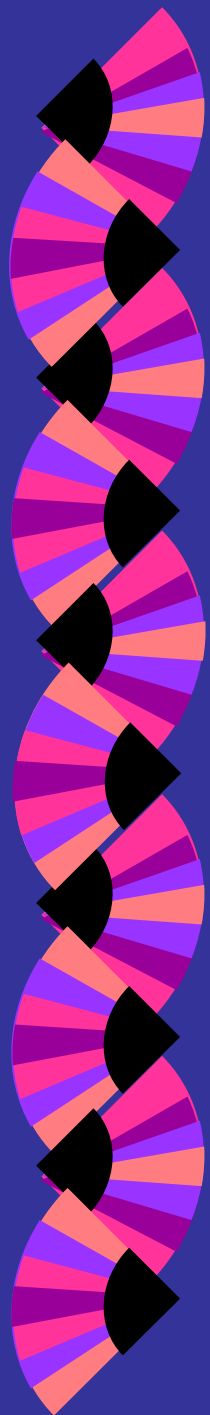
French Bulldog Breeding Inbreeding Coefficients Over Time

<u>Period</u>	<u>Average 10 generation coefficient</u>	
Through 1979	36.27%	+/- 15.17
1980-1984	25.01%	+/- 12.80
1985-1989	19.76%	+/- 9.02
1990-1994	17.69%	+/- 6.97
1995-1999	15.98%	+/- 6.92
2000-2004	13.40%	+/- 6.16
2005-2007	11.40%	+/- 6.22

Breed Inbreeding Coefficients

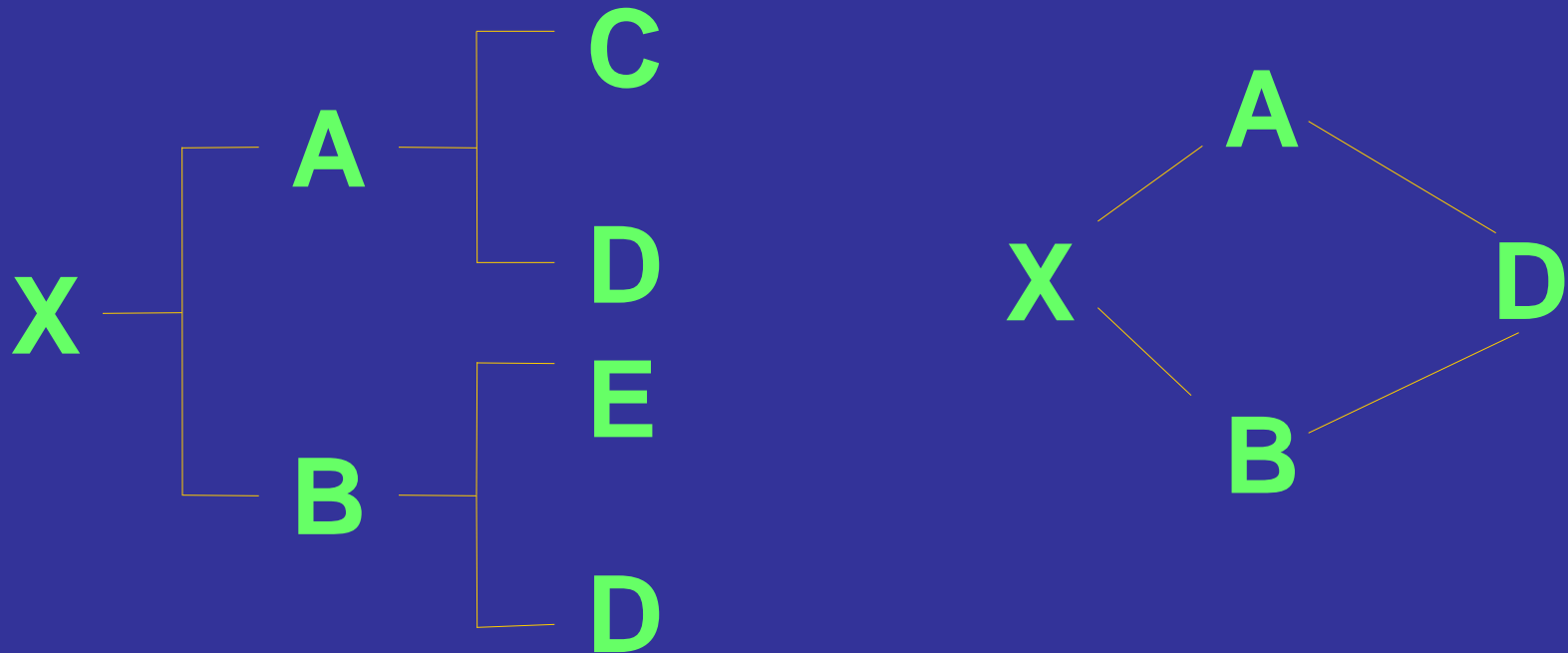


<u>Breed</u>	<u>Period</u>	<u>10 gen. coefficient</u>
American Cocker Spaniel	1980-1999	10.49 +/- 7.33
Bichon Frise	1990-2004	19.55 +/- 7.68
Bernese Mountain Dog	1990-1999	11.32 +/- 4.50
Borzoi	1990-1999	10.48 +/- 8.85
Bouvier des Flandres	1990-1999	13.96 +/- 5.92
Briard	1976-1993	15.18 +/- 7.66
Bull Terrier	1990-1999	19.01 +/- 6.23
Cavalier King Charles Sp.	1990-1999	13.17 +/- 5.83
English Pointer	1990-2005	17.00 +/- 8.07
German Shorthaired Pointer	1990-1995	11.12 +/- 8.50
Great Pyrenees	1985-1990	17.76 +/- 9.17
Irish Setter	1990-2002	15.81 +/- 5.84
Mastiff	1990-1999	11.59 +/- 6.57
Norfolk Terrier	1990-2000	29.79 +/- 7.32
Nova Scotia Duck Tolling Ret.	1990-1999	27.17 +/- 4.48
Poodle, Miniature	1980-2000	16.50 +/- 7.86
Poodle, Standard	1980-2000	16.25 +/- 7.77
Rhodesian Ridgeback	1990-1999	15.91 +/- 6.15
Samoyed	1990-1999	9.94 +/- 7.64
Scottish Deerhound	1970-1997	20.56 +/- 6.23
Siberian Husky	1990-2000	15.47 +/- 6.99



10 Generation Inbreeding Coefficient: 36.13%

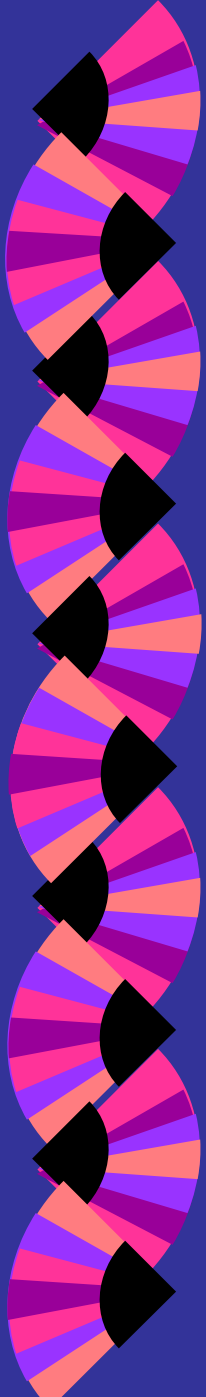
1/2 BROTHER x 1/2 SISTER



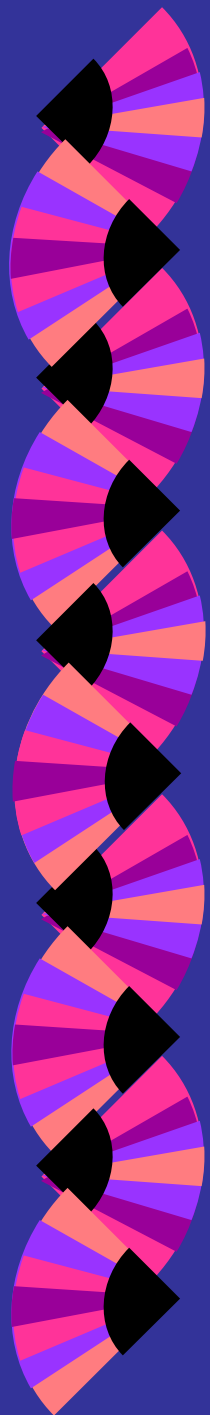
Inbreeding Coefficient = 12.5%

Relationship Coefficient to **D** = 50%

Coefficients for Sample Matings



Type of Mating	Inbreeding Coefficient		Percentage of Blood to Listed Ancestor
Parent x Offspring	25.00%	Parent	75.0%
Full Brother x Sister	25.00%	Common Grandparent	50.0%
Father x Granddaughter	12.50%	Father	62.5%
Half-Brother x Half-Sister	12.50%	Common Grandparent	50.0%
Uncle x Niece	12.50%	Common Grandparent	37.5%
First-Cousin Mating	6.25%	Common Gr.Grandparent	25.0%



L'cream Dream Machine D'mckee

La Petite Pixie De Mckee

Here Tis' Up 'N' Adam De Mckee

Fairmont's Heart To Beat

La Petite Chamonix De Mckee

Cox's Goodtime Dorene

Cox's Goodtime Ace in the Hole



Pedigree Analysis for

Here Tis' Up 'N' Adam De Mckee I.C.= 36.13%

<u>Linebred Ancestors</u>	<u>% Blood</u>	<u>1st Gen.</u>	<u>#Times</u>
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La Petite Pixie De Mckee	50.00%	2	2
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Terrette's Tourbillon D'gamin	44.40%	6	114
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Terrette's Chef D'oeuvre Gamin	39.69%	7	354
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Terrette's Chef D'oeuvre	35.16%	8	1,148
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Hampton's Chevalier	34.38%	5	28
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Jimmy Lee's Sparkle	31.25%	4	9
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Fairmont's Heart To Beat	31.25%	3	3
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Phoebe's Menjou Ii	29.82%	9	2,006
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Terrette's Mitzi	22.84%	9	1,528
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Hampton's Petite Cherie	22.20%	7	114
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Terrette's Enchantress	21.06%	8	380
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Hampton's Poupee D'or	17.38%	6	29
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Jimmy Lee's Flip	17.19%	5	7
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Hampton's Mystique	16.41%	6	16
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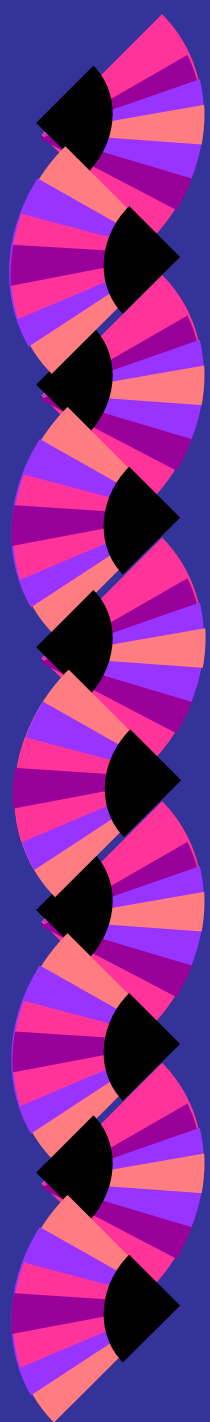
Phoebe's Directoire	16.36%	10	2,365
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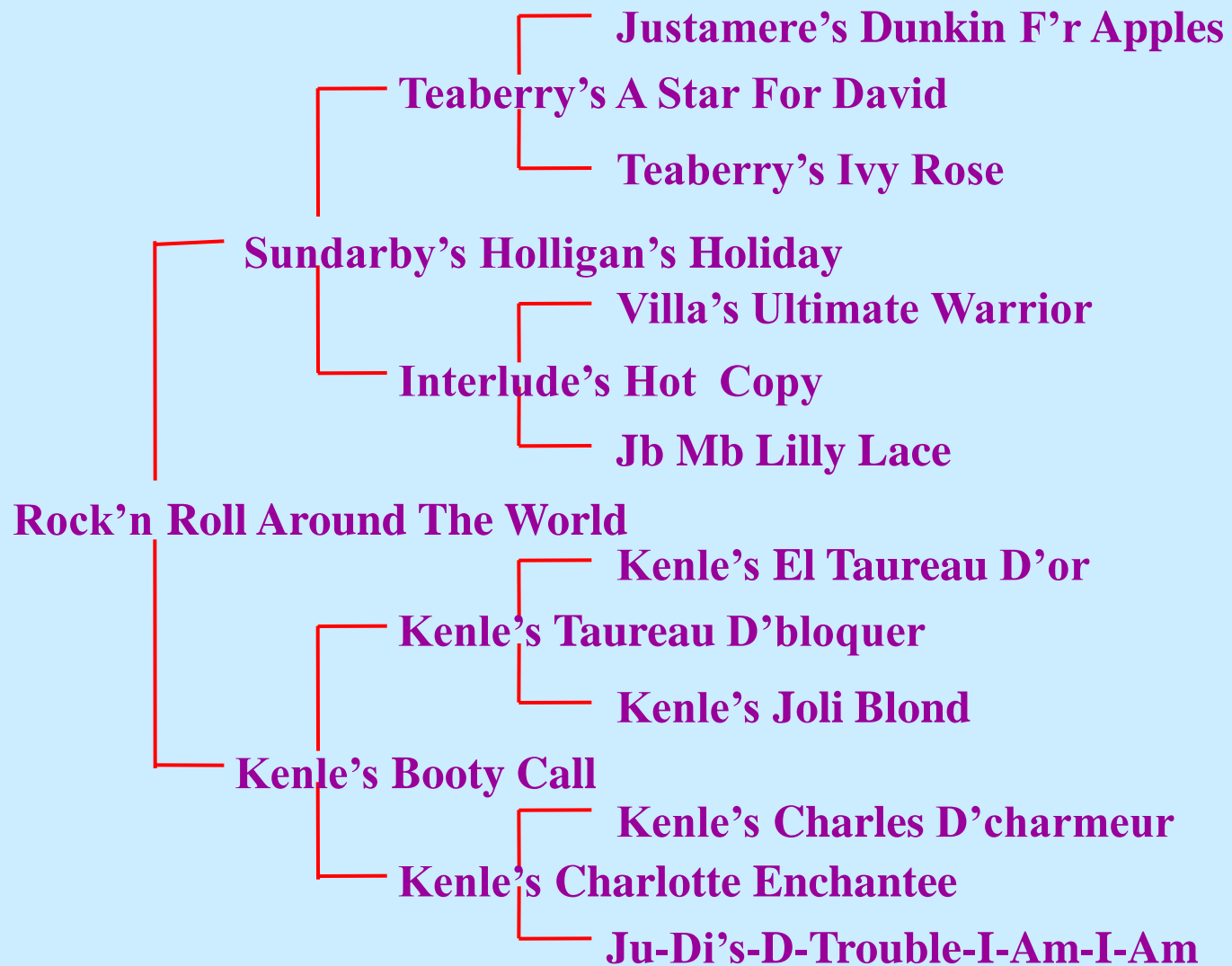
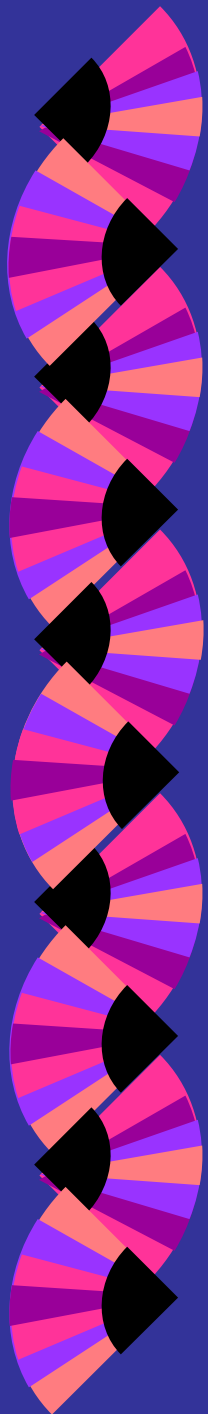
Tigre of Silpho	15.63%	11	4,371
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Phoebe's Rochelle	15.63%	11	4,371
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Holly Oak's Nouvelle Gerri	15.41%	10	2,582
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Gypsy Princess	15.27%	10	2,565
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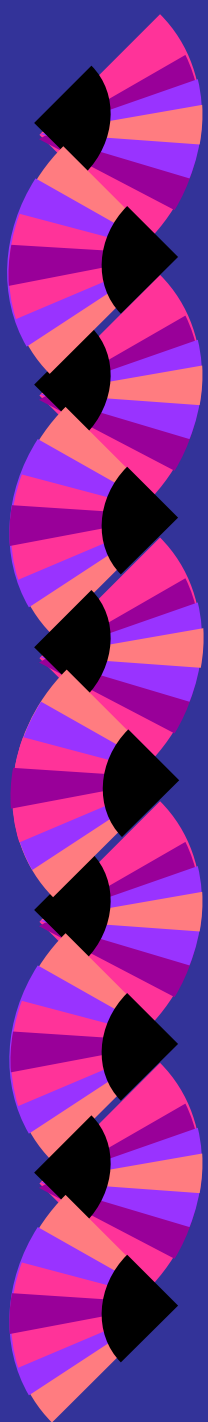


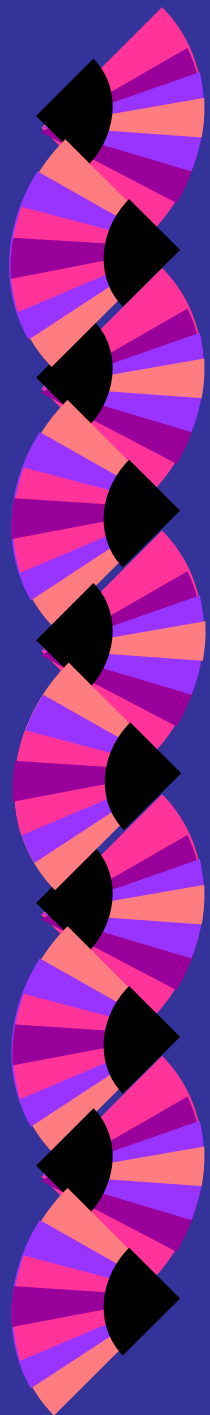
10 Generation Inbreeding Coefficient: 12.16%

Pedigree Analysis for

Rock'n Roll Around The World I.C.= 12.16%

<u>Linebred Ancestors</u>	<u>% Blood</u>	<u>1st Gen.</u>	<u>#Times</u>
Terrette's Tourbillon D'gamin	25.26%	8	3,206
Terrette's Chef D'oeuvre Gamin	24.44%	9	11,022
Terrette's Chef D'oeuvre	23.76%	10	31,778
Cox's Goodtime Rowdy George	21.88%	4	5
Phoebe's Menjou Ii	20.49%	11	50,720
Cox's Goodtime Dorene	15.63%	5	13
Terrette's Mitzi	15.49%	11	38,555
Fairmont's Radar Ahead	14.94%	5	43
Terrette's Enchantress	14.43%	10	12,066
Fairmont's Heart To Beat	12.50%	6	50
Hampton's Chevalier	12.16%	8	486
Jimmy Lee's Sparkle	11.25%	7	139
Phoebe's Directoire	11.17%	12	51,020
Tigre of Silpho	10.70%	13	83,876
Phoebe's Rochelle	10.70%	13	83,876
Holly Oak's Nouvelle Gerri	10.58%	12	54,484
Gypsy Princess	10.27%	12	53,730
Phoebe's Chaminade	10.24%	12	44,468
Cox's Goodtime Ace In The Hole	9.38%	6	8



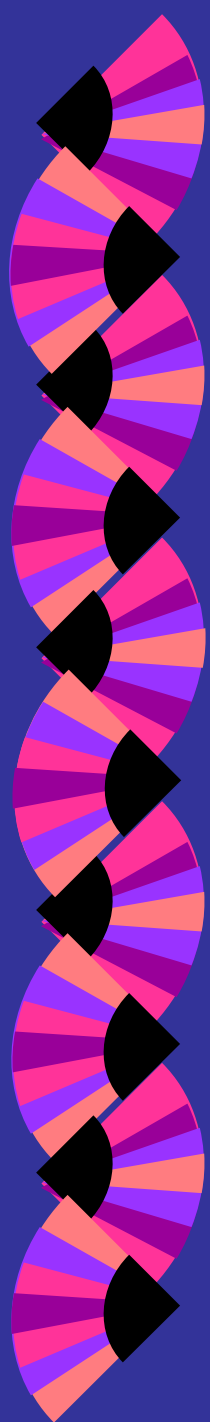


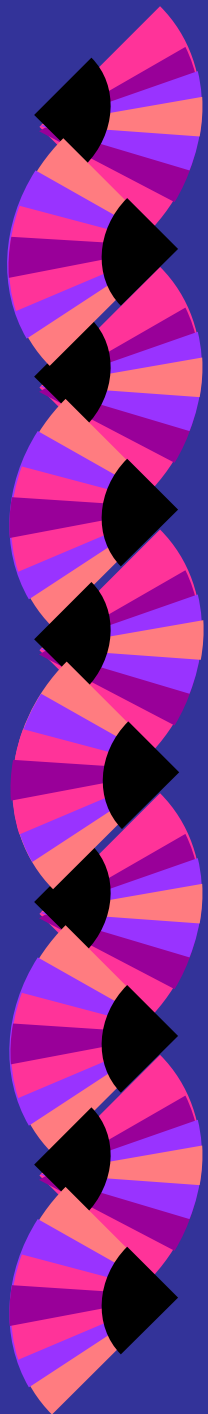
10 Generation Inbreeding Coefficient: 19.66%

Pedigree Analysis for

Cox's Goodtime Charlie Brown I.C.= 19.66%

<u>Linebred Ancestors</u>	<u>% Blood</u>	<u>1st Gen.</u>	<u>#Times</u>
Terrette's Tourbillon D'gamin	31.25%	6	70
Terrette's Chef D'oeuvre Gamin	30.37%	7	237
Terrette's Chef D'oeuvre	29.87%	8	799
Phoebe's Menjou Ii	25.74%	9	1,389
Terrette's Mitzi	19.45%	9	1,066
Terrette's Enchantress	18.07%	8	267
Jimmy Lee's Sparkle	17.19%	4	5
Hampton's Chevalier	16.80%	5	13
Jimmy Lee's Bandolero of Ono	15.63%	4	3
Phoebe's Directoire	14.04%	10	1,629
Tigre of Silpho	13.45%	11	3,018
Phoebe's Rochelle	13.45%	11	3,018
Holly Oak's Nouvelle Gerri	13.31%	10	1,803
Gypsy Princess	12.90%	10	1,773
Scobey's Maurice Bon Homme	12.50%	4	4
Cox's Goodtime Petite Poupee	12.50%	4	2
Terrette's Fils De Bijou	11.52%	6	30
Bedal's Caprise Nocturne	11.06%	8	109
Haworth Boy of Laurelwood	10.94%	11	7,968

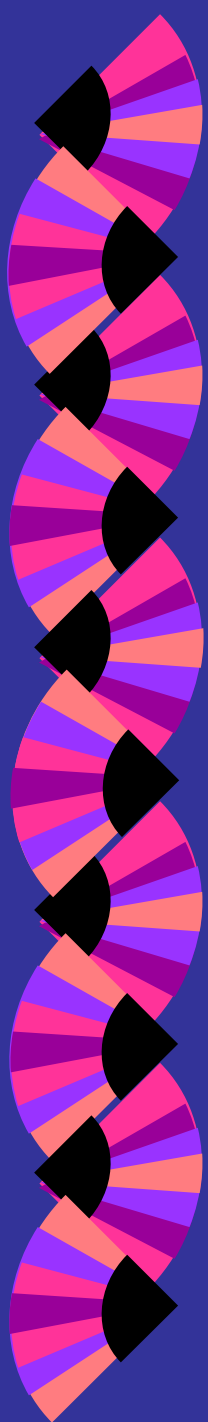


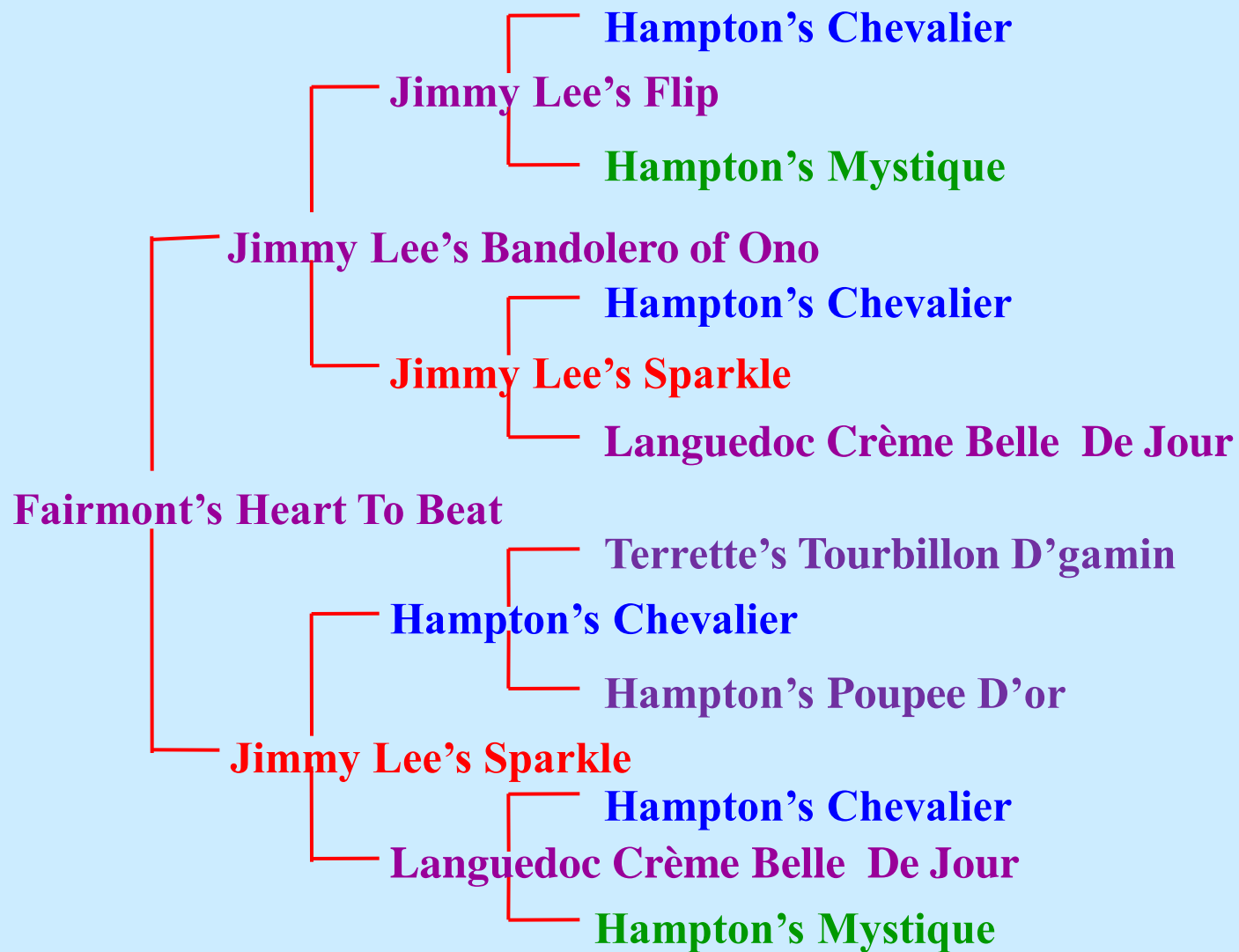
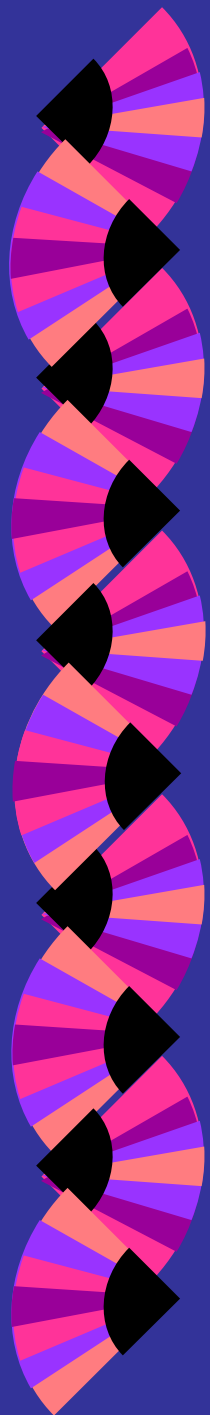


10 Generation Inbreeding Coefficient: 5.49%

Pedigree Analysis for Kruger's Best Chance I.C.= 5.49%

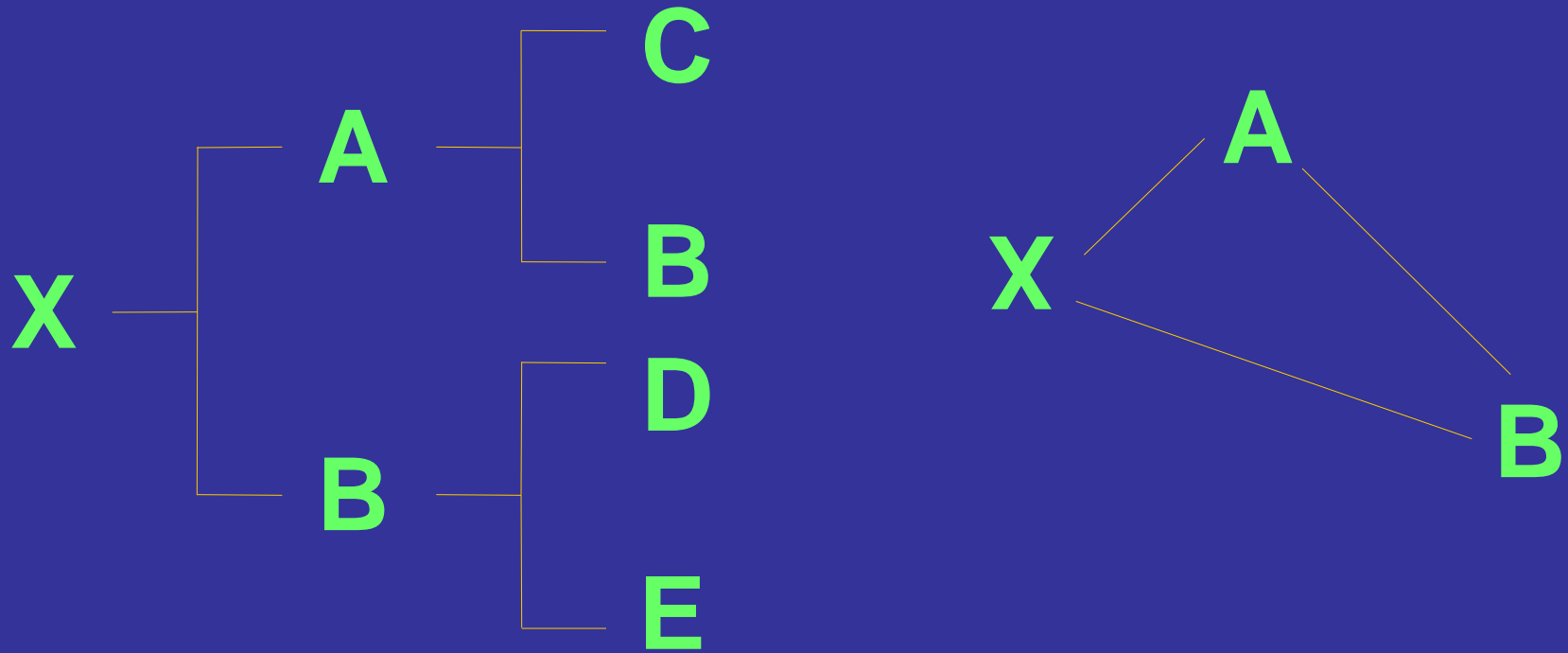
<u>Linebred Ancestors</u>	<u>% Blood</u>	<u>1st Gen.</u>	<u>#Times</u>
Terrette's Tourbillon D'gamin	19.06%	8	4,913
Terrette's Chef D'oeuvre Gamin	18.56%	9	14,699
Terrette's Chef D'oeuvre	18.28%	10	39,429
Phoebe's Menjou Ii	15.82%	11	62,917
Terrette's Mitzi	11.90%	11	48,344
Terrette's Enchantress	11.06%	9	15,071
K N' D Foxy Joe of Cox's Goodtime	10.16%	4	4
Hampton's Petite Cherie	9.53%	9	4,673
Balihai Quad	8.89%	6	41
Hampton's Chevalier	8.67%	8	718
Phoebe's Directoire	8.61%	12	66,854
Tigre of Silpho	8.26%	13	117,291
Phoebe's Rochelle	8.26%	13	117,291
Holly Oak's Nouvelle Gerri	8.14%	12	73,271
Smiths Bon Mot	8.10%	8	268
Gypsy Princess	7.93%	12	72,311
Phoebe's Chaminade	7.91%	12	58,140
Fairmont's Heart To Beat	7.35%	6	75
Bedal's Caprise Nocturne	6.94%	10	6,090





10 Generation Inbreeding Coefficient: 72.34%

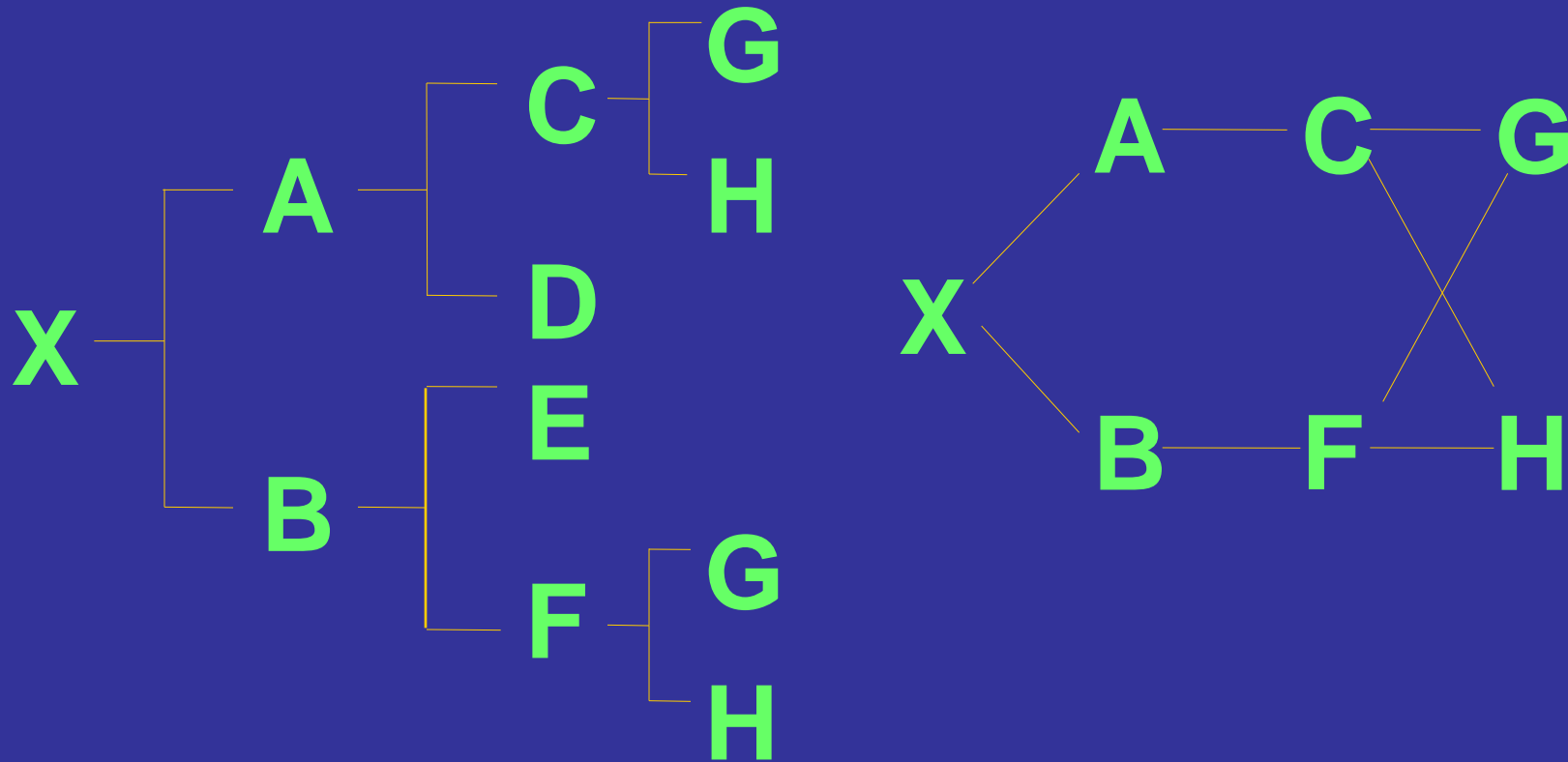
MOTHER X SON



Inbreeding Coefficient = 25%

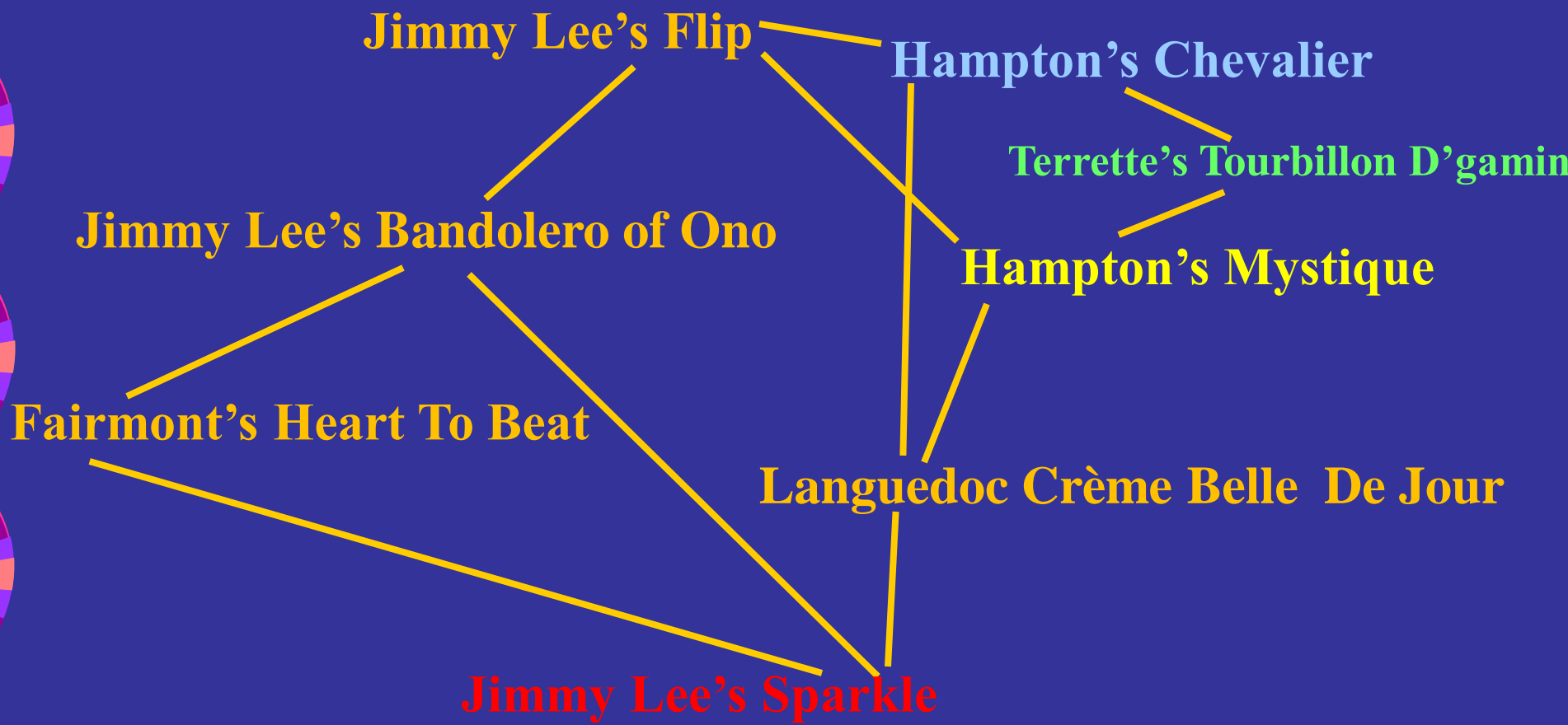
Relationship Coefficient to **A** = 75%

1st COUSIN MATING



Inbreeding Coefficient = 6.25%

Relationship Coefficient to G & H = 25%



Jimmy Lee's Flip

Hampton's Chevalier

Terrette's Tourbillon D'gamin

Jimmy Lee's Bandolero of Ono

Hampton's Mystique

Fairmont's Heart To Beat

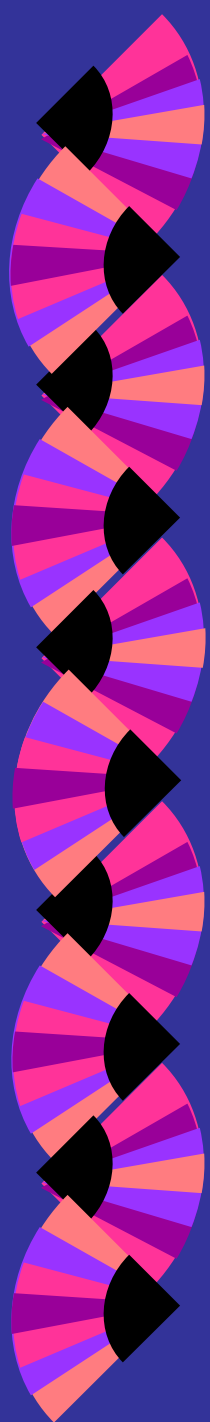
Languedoc Crème Belle De Jour

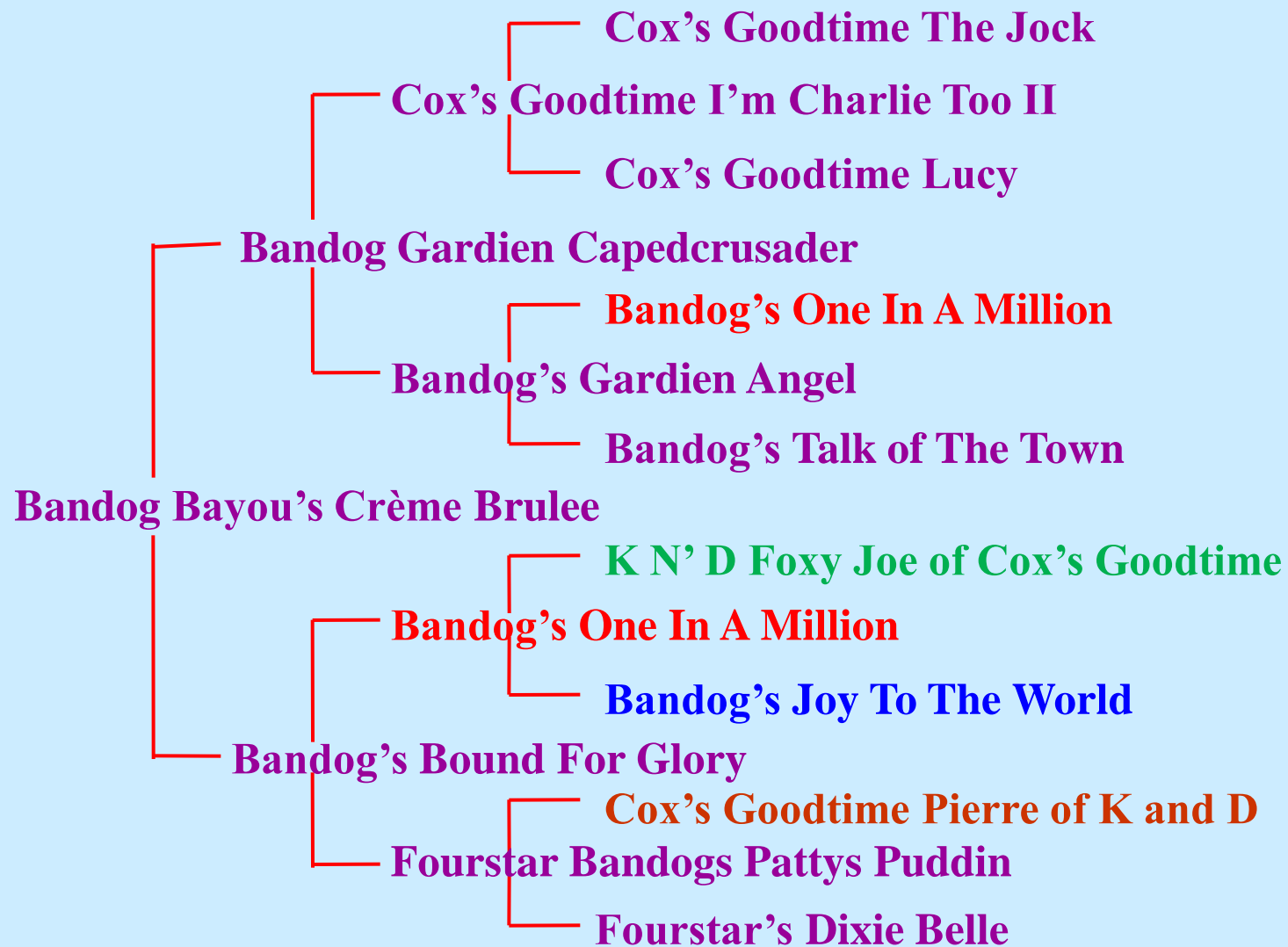
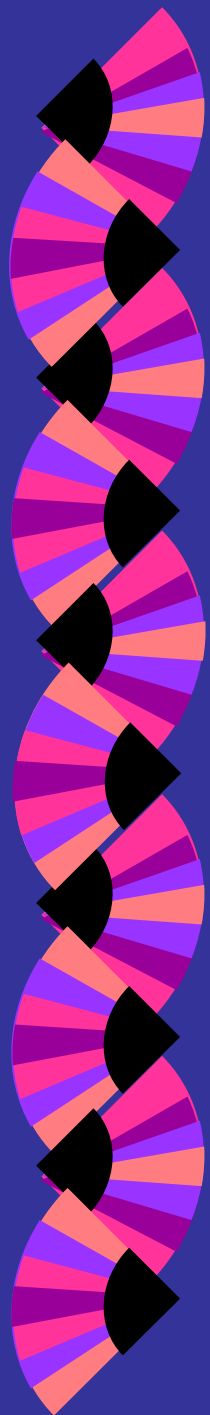
Jimmy Lee's Sparkle

Pedigree Analysis for

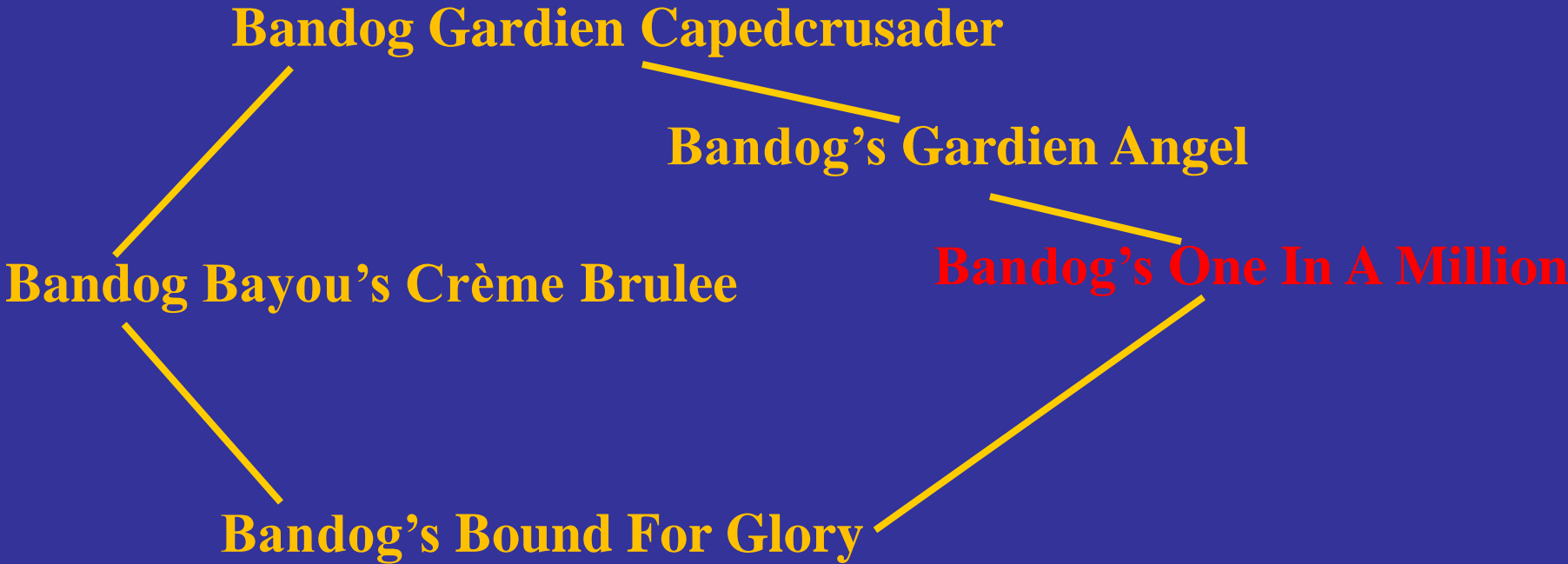
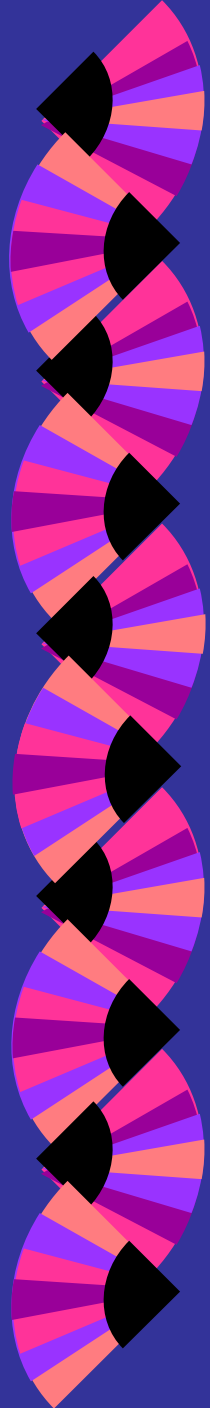
Fairmont's Heart To Beat I.C.= 72.34%

<u>Linebred Ancestors</u>	<u>% Blood</u>	<u>1st Gen.</u>	<u>#Times</u>
Jimmy Lee's Sparkle	75.00%	1	2
Hampton's Chevalier	68.75%	2	5
Terrette's Tourbillon D'gamin	67.19%	3	13
Terrette's Chef D'oeuvre Gamin	58.59%	4	37
Terrette's Chef D'oeuvre	50.27%	5	117
Phoebe's Menjou Ii	42.32%	6	207
Terrette's Mitzi	32.46%	6	154
Hampton's Mystique	31.25%	3	3
Hampton's Valentine	25.00%	4	8
Phoebe's Directoire	23.32%	7	249
Bedal's Caprise Nocturne	23.05%	5	21
Tigre of Silpho	22.24%	8	456
Phoebe's Rochelle	22.24%	8	456
Holly Oak's Nouvelle Gerri	21.81%	7	265
Gypsy Princess	21.81%	7	265
Haworth Boy of Laurelwood	18.25%	8	1,186
Laurelwood Jeep	16.31%	8	349
Bedal's Blanc Fleur De Lys	13.97%	6	32
Laurelwood Bon Bijou	13.61%	9	879





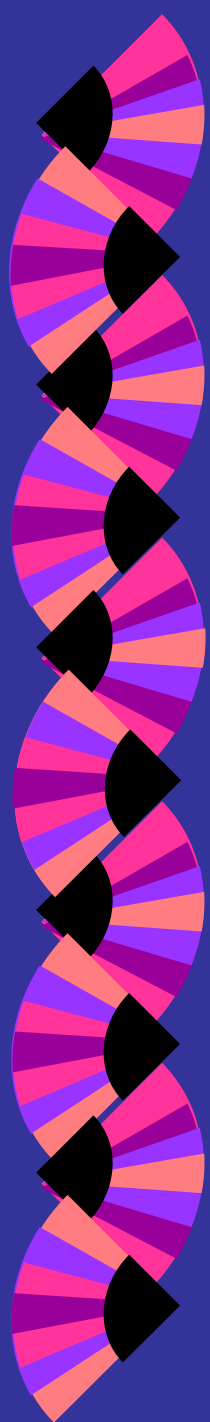
10 Generation Inbreeding Coefficient: 24.49%



Pedigree Analysis for

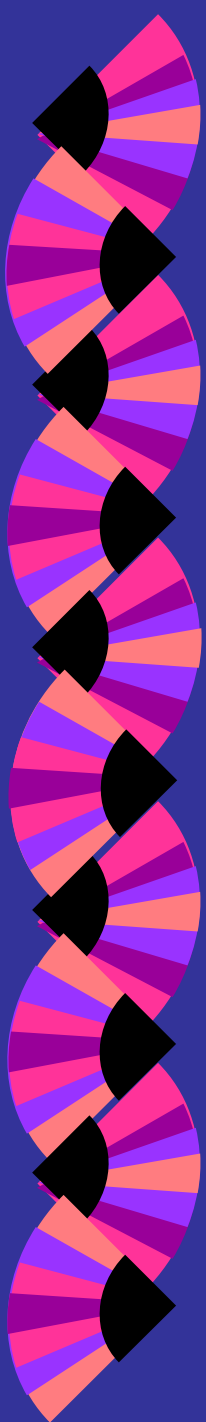
Bandog Bayou's Crème Brulee I.C.= 24.49%

<u>Linebred Ancestors</u>	<u>% Blood</u>	<u>1st Gen.</u>	<u>#Times</u>
Bandog's One In A Million	37.50%	2	2
Terrette's Tourbillon D'gamin	26.58%	8	2,512
Terrette's Chef D'oeuvre	26.51%	10	30,067
Terrette's Chef D'oeuvre Gamin	26.34%	9	8,859
Bandog's Joy To The World	25.00%	3	3
Phoebe's Menjou Ii	22.91%	11	52,032
K N' D Foxy Joe of Cox's Goodtime	20.31%	3	3
Cox's Goodtime Ace In The Hole	19.24%	4	15
Terrette's Mitzi	17.22%	11	39,908
Cox's Goodtime Charlie Brown	16.41%	4	4
Fairmont's Heart To Beat	16.25%	5	65
Terrette's Enchantress	15.88%	10	10,055
Lebull Adams Dina of Ragtime	15.63%	4	5
Cox's Goodtime Pierre of K and D	15.63%	3	2
Adams' Unique Physique	15.23%	5	32
Cox's Goodtime Dorene	15.21%	5	29
Jimmy Lee's Sparkle	14.03%	6	152
Tigre of Silpho	11.96%	13	109,430
Haworth Boy of Laurelwood	9.71%	13	252,296

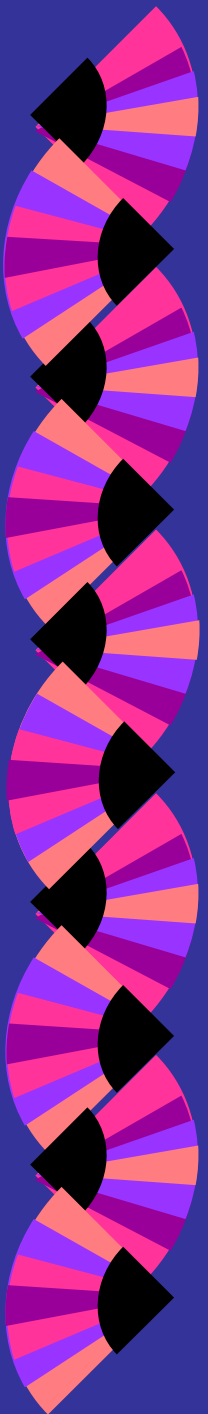


Inbreeding Coefficients vs. Depth of Pedigree

<u>Here Tis' Up</u> <u>'N' Adam</u> <u>De Mckee</u>	<u>Rock'n Roll</u> <u>Around</u> <u>The World</u>	<u>Cox's</u> <u>Goodtime</u> <u>Charlie Brown</u>	<u>Gen</u>	<u>Kruger's</u> <u>Best</u> <u>Chance</u>	<u>Fairmont's</u> <u>Heart</u> <u>To Beat</u>	<u>Bandog</u> <u>Bayou's</u> <u>Crème Brulee</u>
12.50	0	0	2	0	40.63	0
14.06	0	0	3	0	54.69	7.81
16.65	0	4.30	4	17.29	58.59	10.55
19.99	1.17	5.91	5	19.51	63.32	12.97
23.85	2.87	10.25	6	0.31	68.12	16.23
27.58	4.40	13.30	7	1.26	69.86	17.70
31.94	6.35	15.46	8	2.03	71.74	19.88
36.13	12.16	19.66	10	5.46	72.34	24.49
37.68	15.53	21.02	12	8.22	72.43	27.64



Genetic Diversity



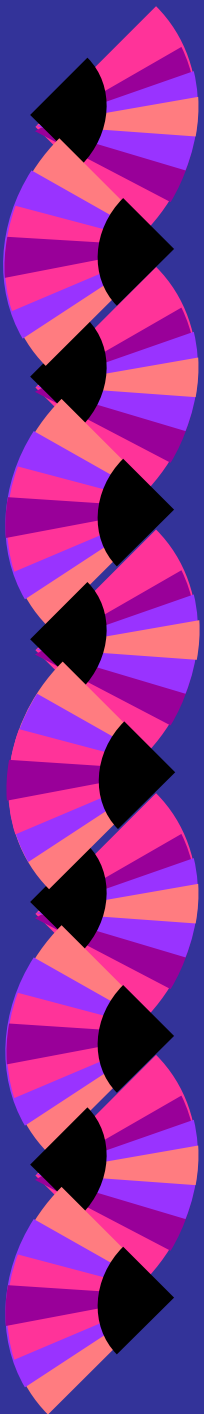


Many breeders are concerned with breed-wide genetic diversity

- ◆ Some breeders propose only assortative mating and outbreeding to those least related
- ◆ Selection, not the types of matings affect breed diversity

Assortative Mating

- ◆ Breeding only on the basis of appearance (phenotype versus genotype or relation)
 - ◆ Positive assortative mating: Breeding like to like
 - ◆ Negative assortative mating: Breeding like to unlike





Linebreeding

- ◆ Increases Homozygosity
- ◆ Exposes deleterious (recessive) genes through increased homozygosity
- ◆ Does not create deleterious genes
- ◆ Attempts to create predictability and reproducibility in offspring

Outbreeding

- ◆ Decreases Homozygosity
- ◆ Tends to prevent (recessively) affected individuals through heterozygosity
- ◆ Does not eliminate recessive genes.
- ◆ Tends to bring in novel genes
- ◆ Tends to produce more variability in litters

Outbreeding versus Linebreeding: 4 Dog Example

Parent Generation:

Dog1	Dog2	Dog3	Dog4
AA	BB	AA	BB

Gene Frequencies:

50% A & 50% B

Offspring Generation:

AB	AB
AB	AB

Gene Frequencies:

50% A & 50% B

Parent Generation:

Dog1	Dog3	Dog2	Dog4
AA	AA	BB	BB

Gene Frequencies:

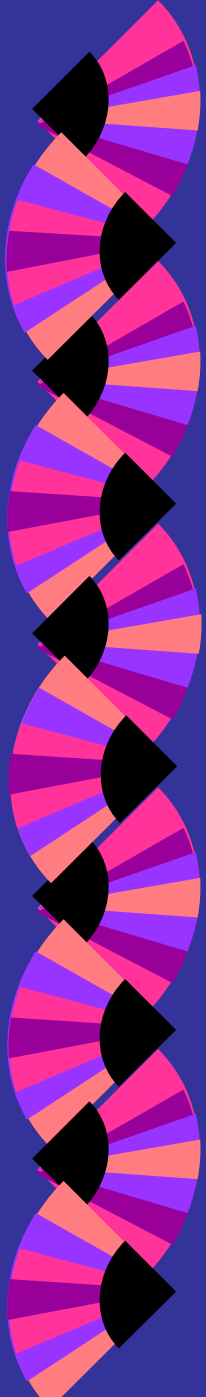
50% A & 50% B

Offspring Generation:

AA	BB
AA	BB

Gene Frequencies:

50% A & 50% B

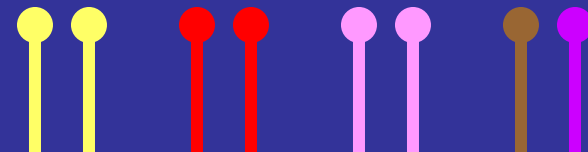


A theoretical mating with four offspring

Sire



Dam



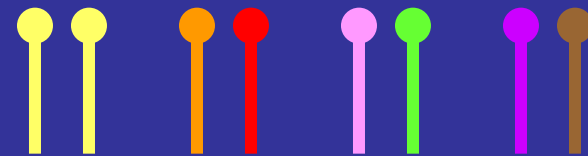
X

||

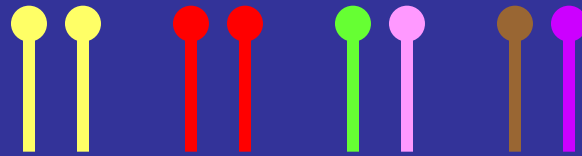
A



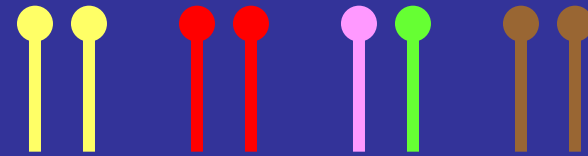
B



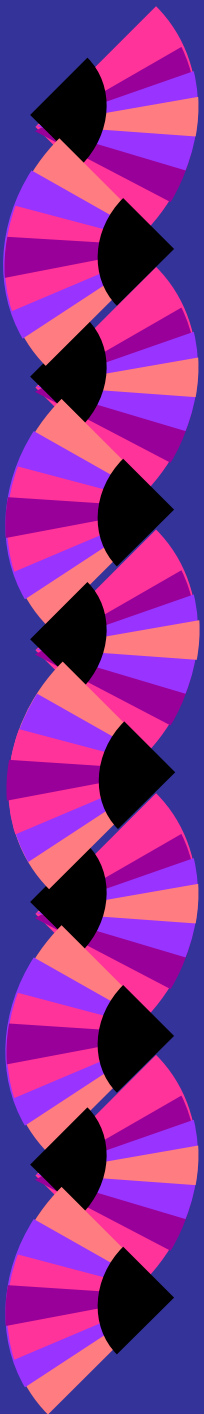
C

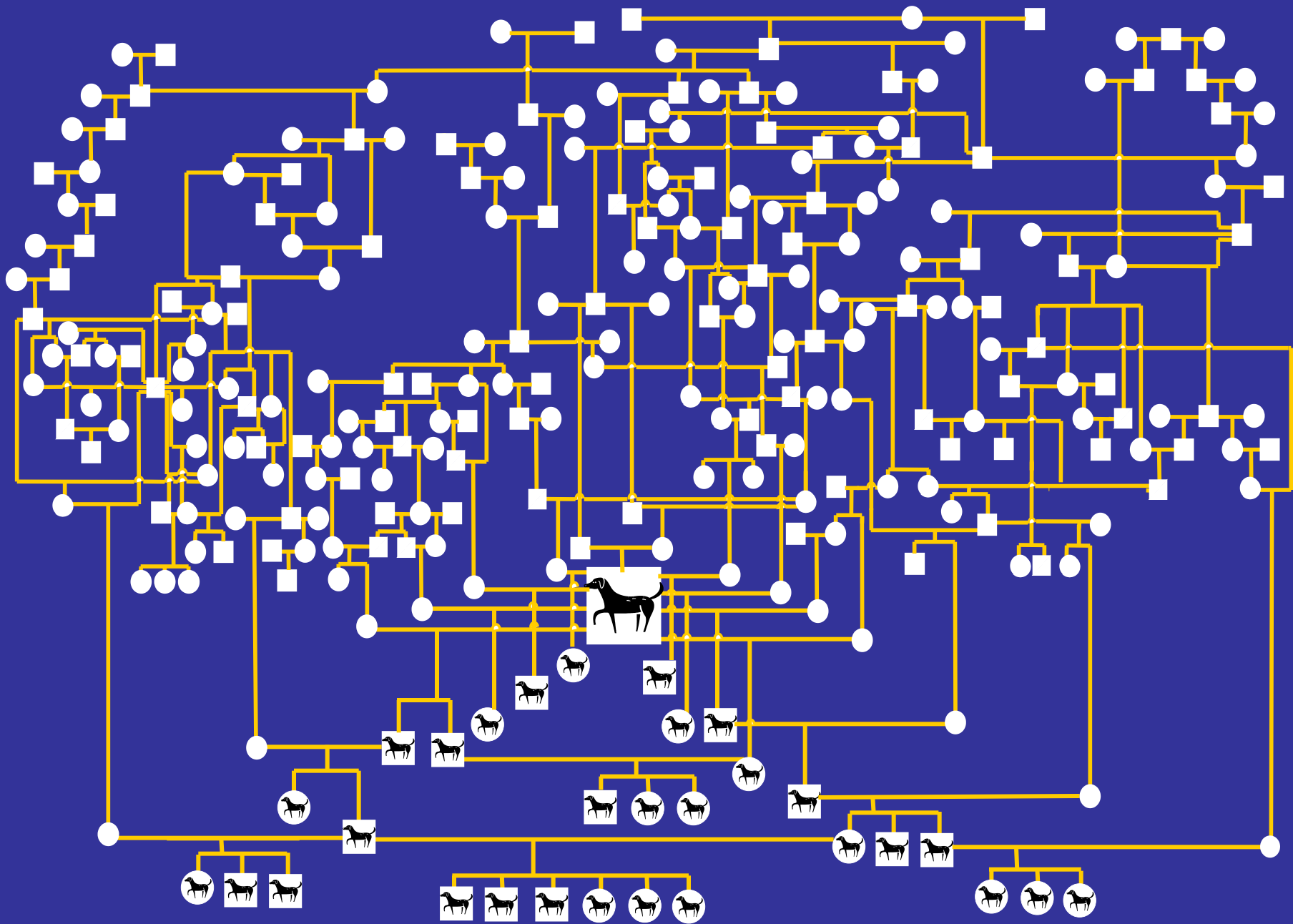
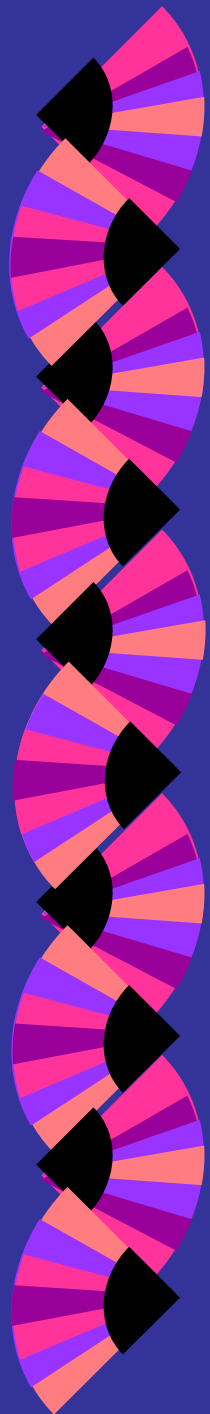


D



The Popular Sire Syndrome







Popular Sire Syndrome

- ◆ The overuse of individual breeding dogs contributes the most to:
 - ◆ Decreased diversity (population bottlenecks)
 - ◆ Increased spread of defective genes (founders effect)



Popular Sire Syndrome

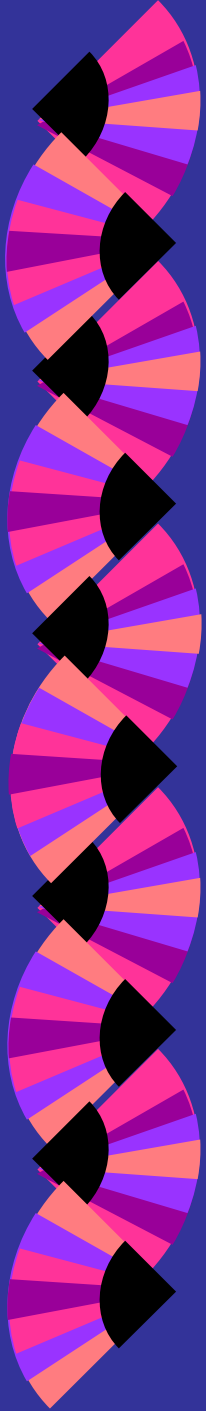
The overuse of individual breeding males excludes or reduces the influence of other quality males, thus narrowing the gene pool.



Genetic Diversity

=

Breeder Diversity



It is the varied opinion of breeders as to what constitutes the ideal dog, and their selection of breeding stock that maintains breed diversity



*DEVELOPING A HEALTHY
BREEDING PROGRAM*



Breeding Goals

- ◆ **Maintain and enhance the quality of the breed**
 - ◆ **Do not limit the genetic diversity of the population**
- ◆ **Genetic Disease Control**
 - ◆ **Do not produce affected animals**
 - ◆ **Decrease the (carrier) frequency of defective genes**



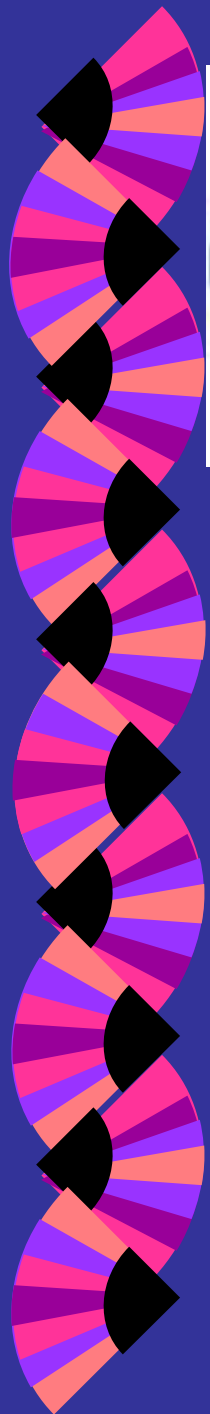
The Goal of Genetic Counseling

**To effectively control
the spread of defective genes,
while preserving the health
and genetic diversity of the
population.**



Canine Health Foundation

AMERICAN KENNEL CLUB





Top 10 Canine Health Concerns

(AKC Canine Health Foundation)

- | | |
|------------------------|--------------------------|
| #1 Cancer (#4) | #7 Autoimmune |
| #2 Eye Disease (#9PRA) | Disease (#7) |
| #3 Epilepsy (#1) | #8 Allergies (#8) |
| #4 Hip Dysplasia (#2) | #9 Patellar |
| #5 Hypothyroidism (#3) | Luxation (#10) |
| #6 Heart Disease (#6) | #10 Renal Dysplasia (--) |

#s in parentheses = 2002 rankings. Bloat was #5

Health Issues by Diagnosis in the French Bulldog

2009 FBCA Health Survey

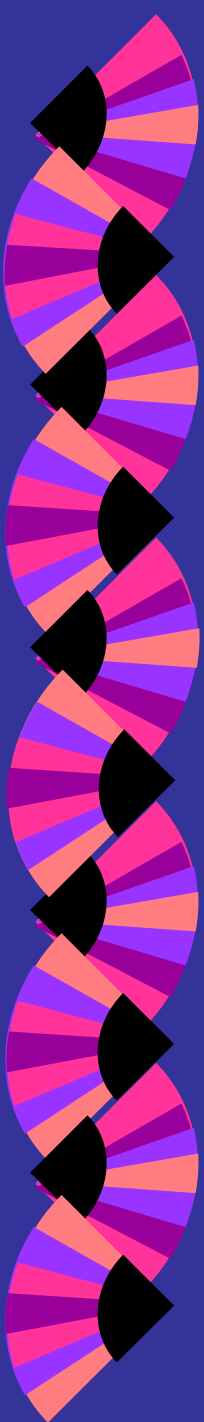


• Vertebral Malform.	35.09%	• Hypoplastic Trachea	4.36%
• Allergic Dermatitis	27.98%	• Cryptorchidism	4.15%
• Stenotic Nares	21.56%	• Demodex-generalized	4.13%
• Elongated Soft Palate	15.83%	• Hip Dysplasia	4.13%
• Food Allergy	14.22%	• Other-Ophtho	3.90%
• Other-Temperament	8.49%	• Resorption of litters	3.70%
• Allergic Rhinitis	7.80%	• Other – Dermatologic	3.44%
• Pyometra	7.00%	• Frequent cystitis	3.21%
• Irregular or Split Heats	6.58%	• Mast Cell Tumor	2.98%
• Intervertebral Disc Dz	5.50%	• Hypothyroidism	2.98%
• Other Female Repro	5.35%	• Wry Jaw	2.98%
• Other-Gastrointestinal	5.05%	• Other Respiratory	2.98%
• Extreme Aggression	4.59%	• Degenerative Myelopathy	2.29%

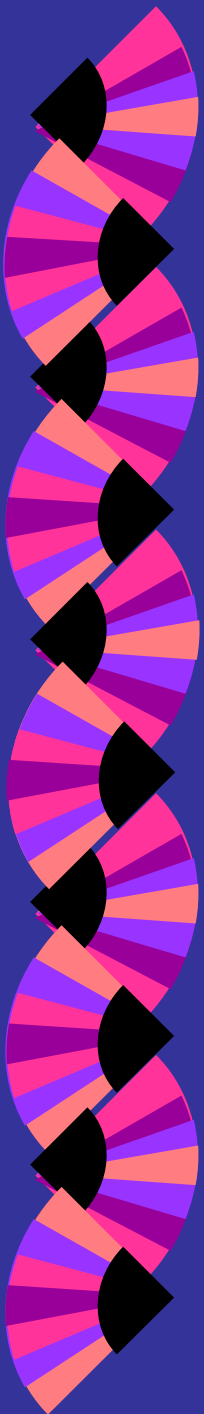
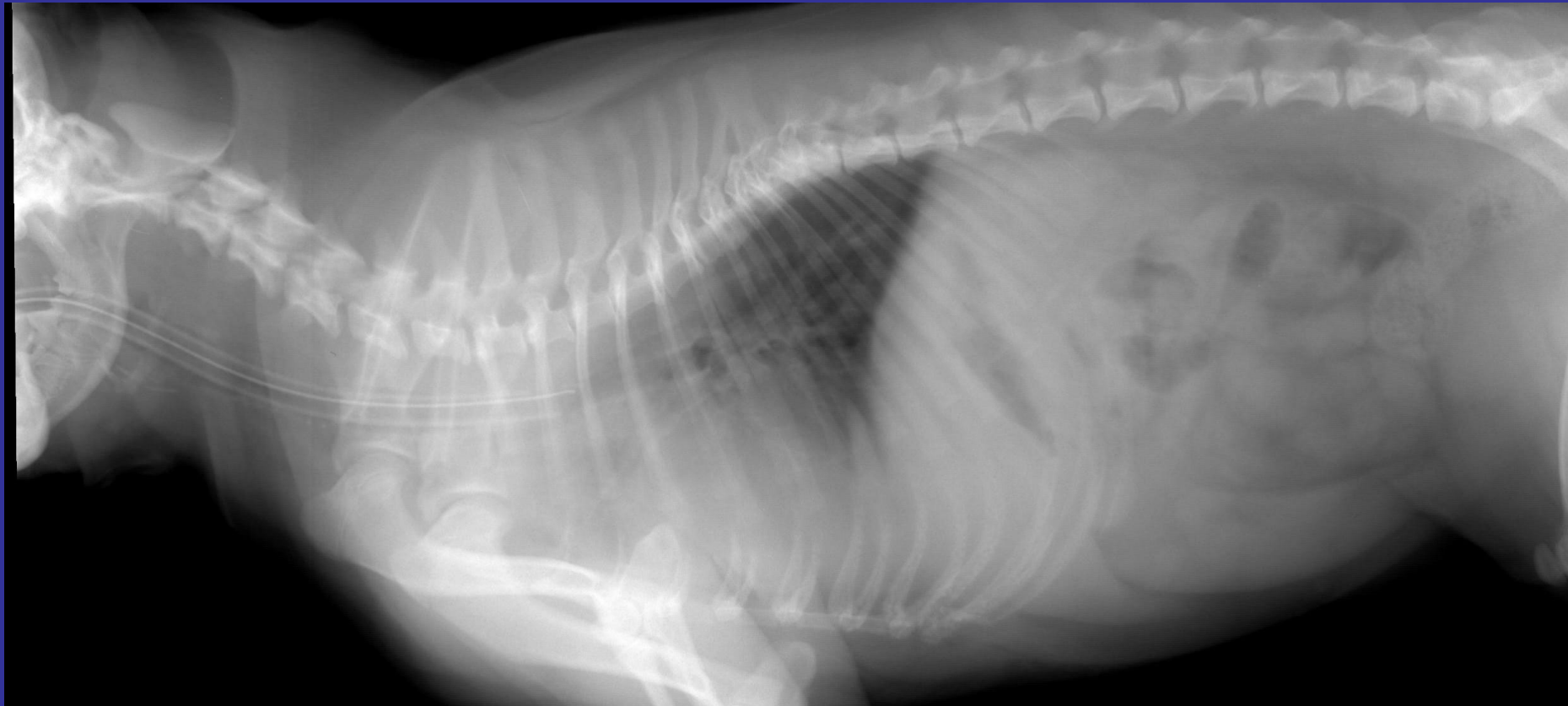
Important Disorders or Problems in the French Bulldog

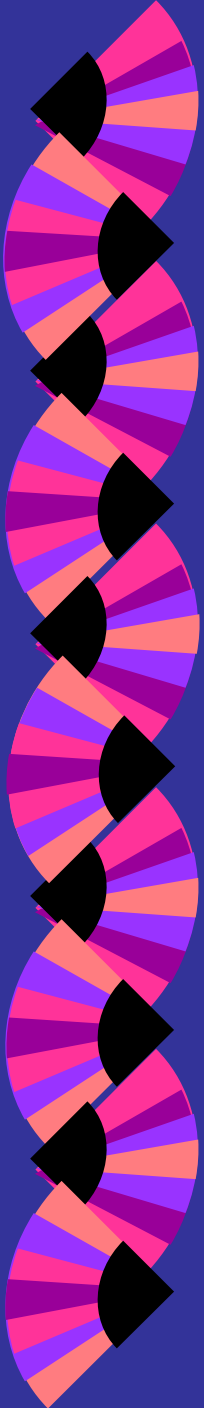
2009 FBCA Health Survey

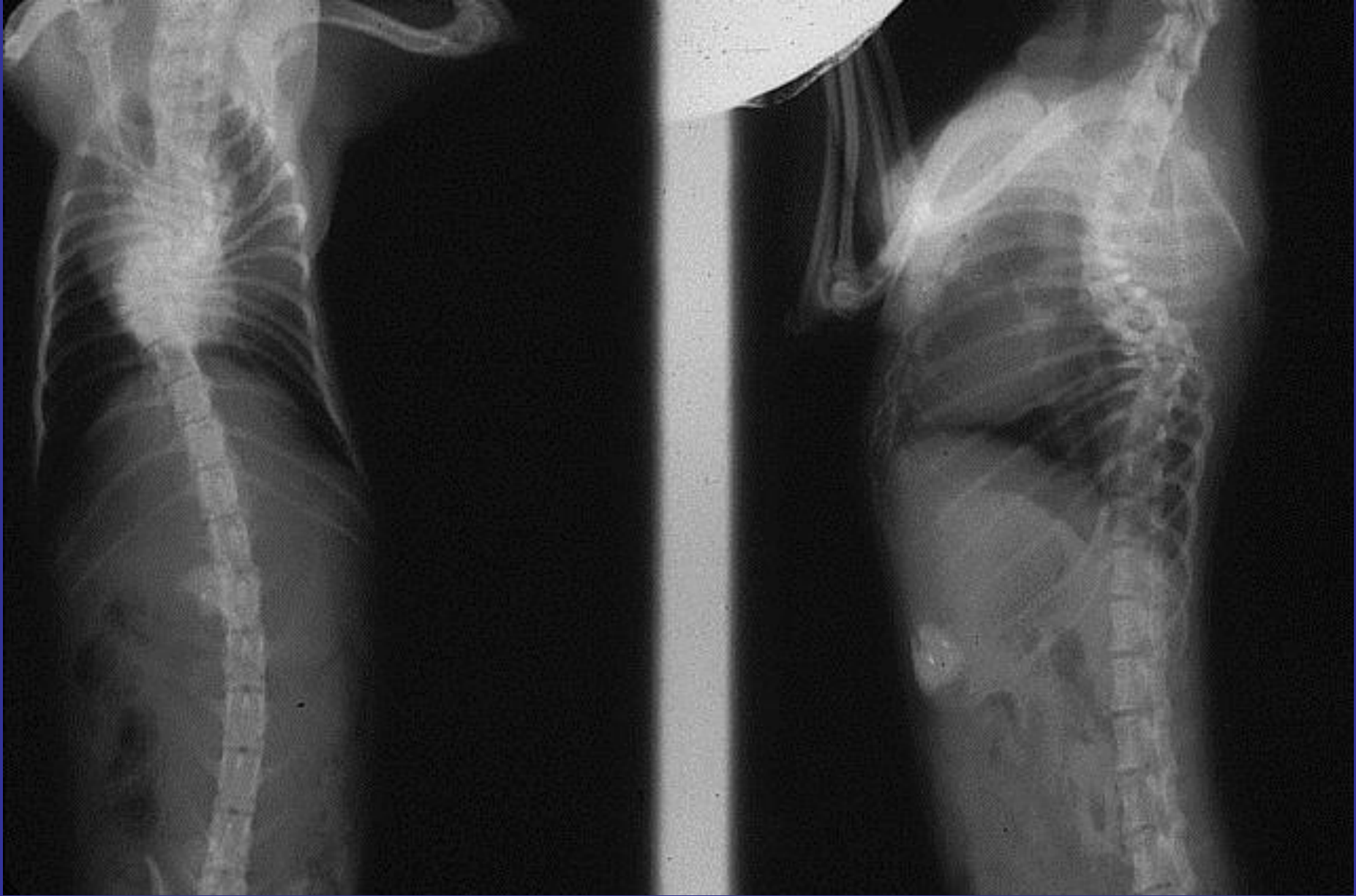
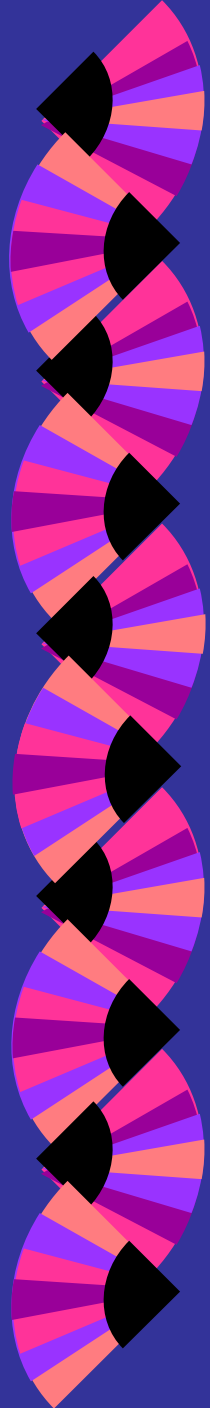
- **Airway/Breathing** 32.34%
- **Vertebral Malformation** 27.06%
- **Allergies** 23.62%
- **Orthopedic Disease** 13.07%
- **Cancer** 7.57%
- **Eye Disease** 4.36%
- **Cardiac/Pulmonary Dz** 3.21%



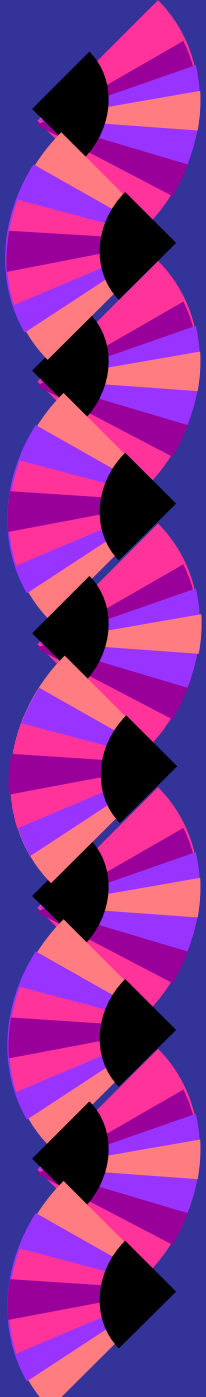
Vertebral Malformations in the French Bulldog





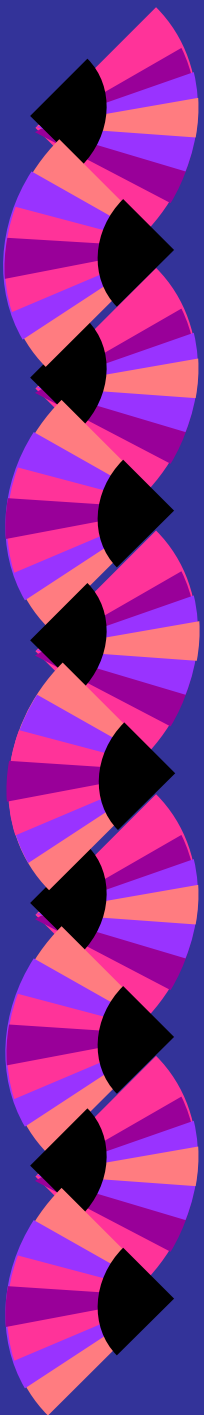


Vertebral Malformations in the French Bulldog

- 
- ◆ Different Types of Malformations
 - ◆ Hemivertebrae
 - ◆ Butterfly Vertebrae
 - ◆ Block Vertebrae
 - ◆ Transitional Vertebrae
 - ◆ 668 French Bulldogs in the OFA Spine Database
 - ◆ 95.1% of French Bulldogs show some vertebral abnormalities in OFA Spine Database
 - ◆ 35.09% reported in the FBCA Health Survey

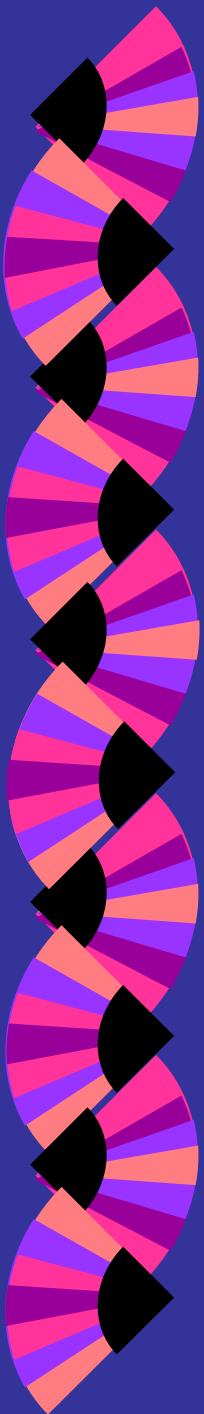
Vertebral Malformations in the French Bulldog

- ◆ Abnormal Vertebrae Seen
 - ◆ Hemivertebrae 73.8%
 - ◆ Butterfly Vertebrae 18.1%
 - ◆ Block Vertebrae 6.9%
 - ◆ Transitional Vertebrae 1.2%
- ◆ Location of Abnormal Vertebrae
 - ◆ Cervical Spine 1.5%
 - ◆ Thoracic Spine 95.1%
 - ◆ Lumbar Spine 3.4%

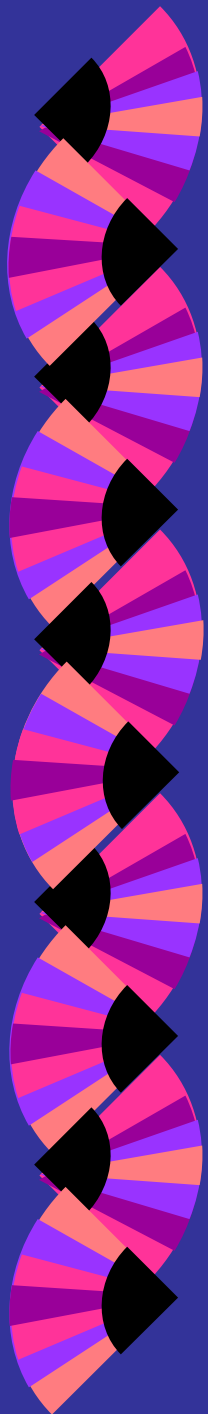


Vertebral Malformations in the French Bulldog

- ◆ Degenerative disk disease is not correlated to vertebral malformations
- ◆ Most vertebral malformations do not cause clinical pain or discomfort
- ◆ Spines among littermates and results of breeding based on parental status vary



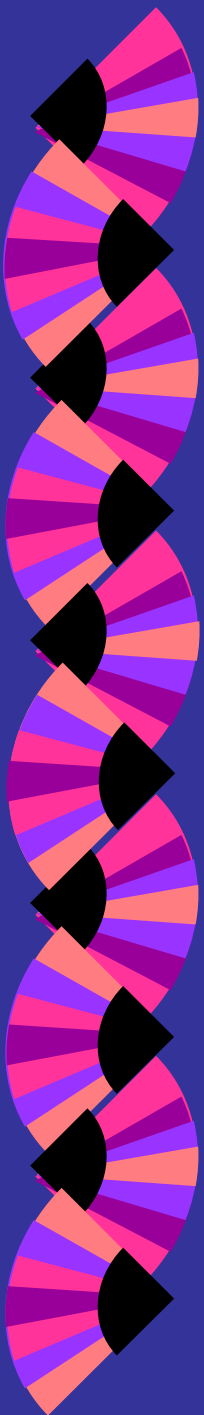
Allergic Dermatitis in the French Bulldog



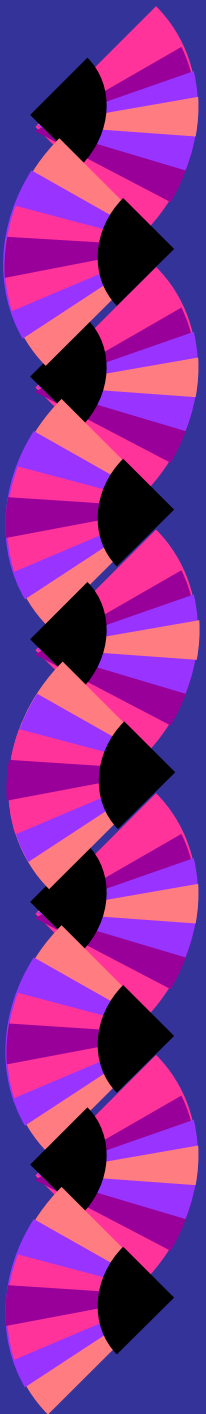
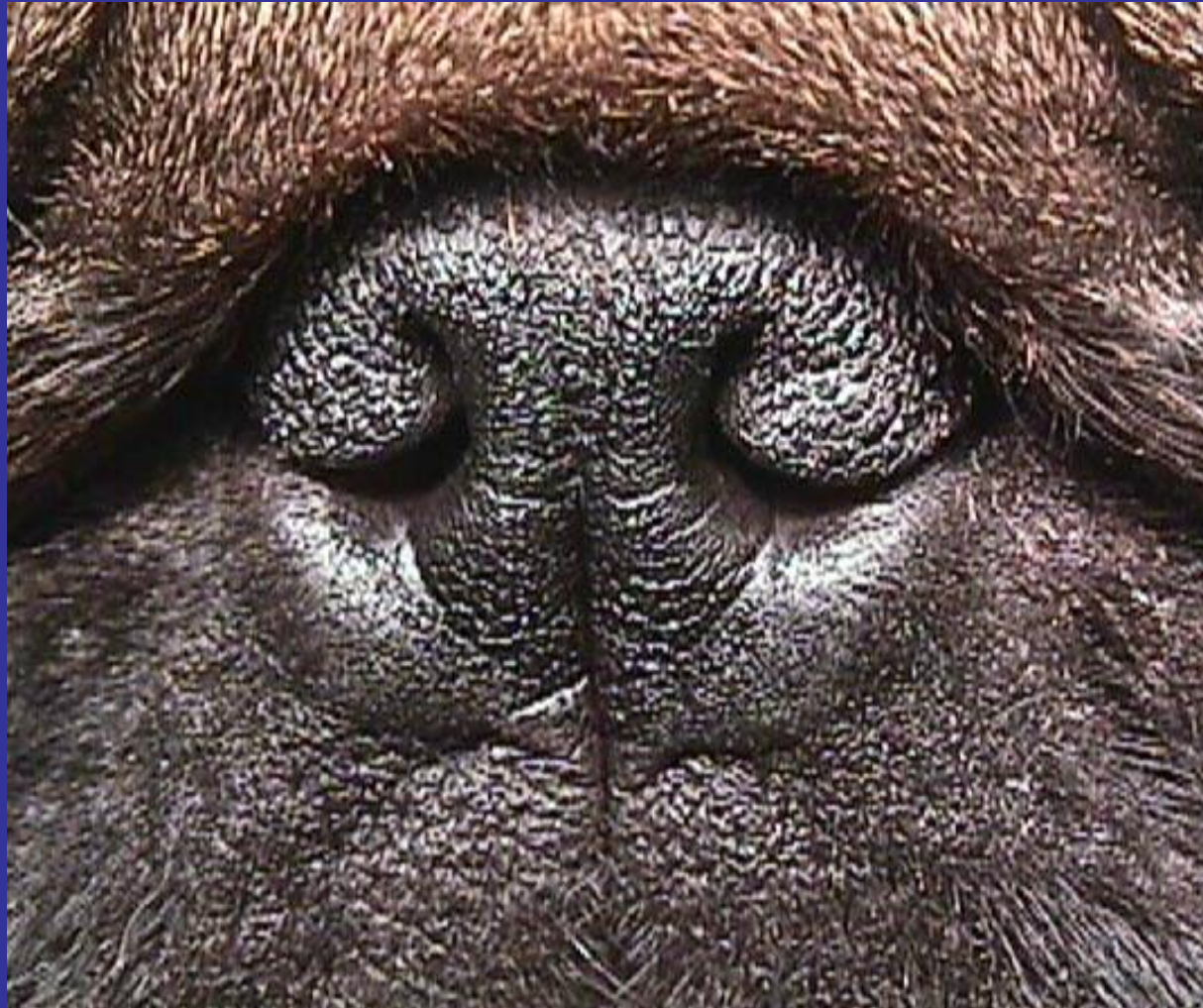
27.98% in the FBCA Health Survey

Brachycephalic Syndrome in the French Bulldog

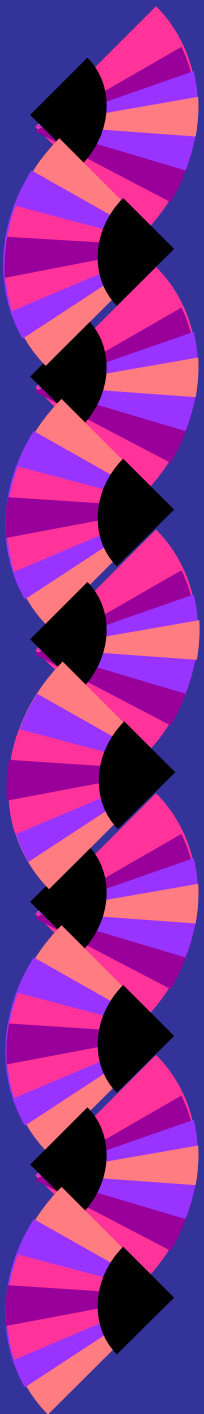
- ◆ Disorder of respiratory difficulty due to anatomical restriction of air movement
- ◆ Can cause sudden death
- ◆ Syndrome based on several components
 - ◆ Stenotic Nares
 - ◆ Elongated Soft Palate
 - ◆ Hypoplastic Trachea
 - ◆ Everted Laryngeal Saccules



Stenotic Nares

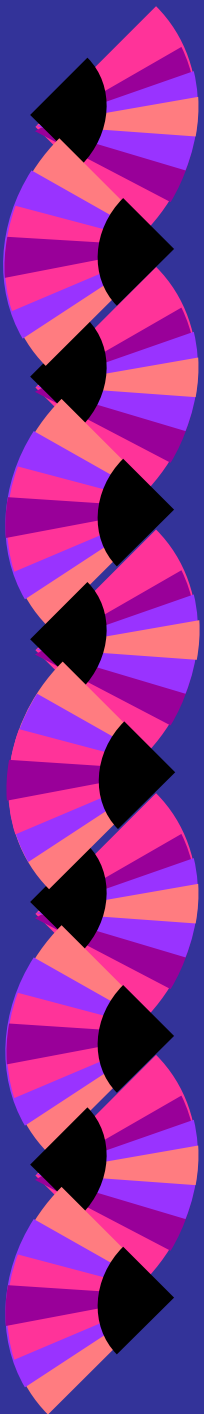


Stenotic Nares

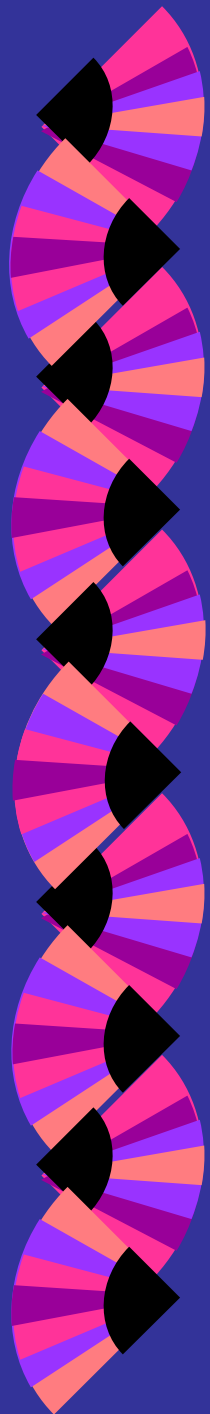


Stenotic Nares in the French Bulldog

- ◆ Dr. Joe Hauptman, Michigan State University is conducting AKC-CHF funded research sponsored by the French Bulldog Club of America
- ◆ Does the surgical correction of stenotic nares prevent or alleviate development of the brachycephalic syndrome?
- ◆ Normal nostril opening should be 32% of the width of the nose
- ◆ Dogs are not born with elongated soft palate – it develops as the dog grows



Canine Hip Dysplasia



OFA Hip Statistics for the French Bulldog

Rank #15/153 (603 radiographs)

64.2% Normal

1.0% Excellent (15.7% for all breeds)

32.7% Good

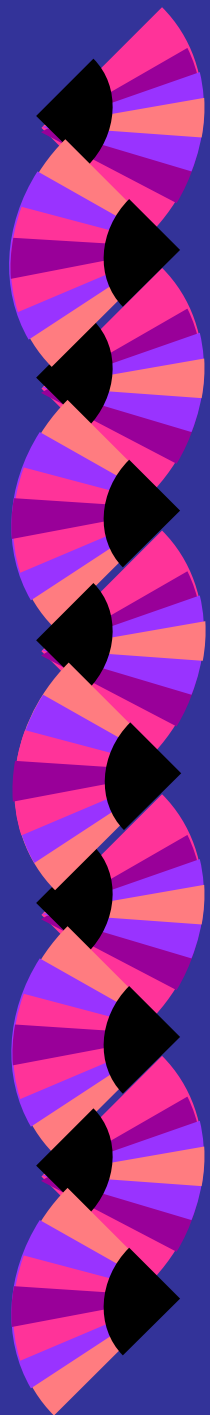
30.5% Fair

34.0% Dysplastic (11.4% for all breeds)

21.4% Mildly Dysplastic

10.6% Moderately Dysplastic

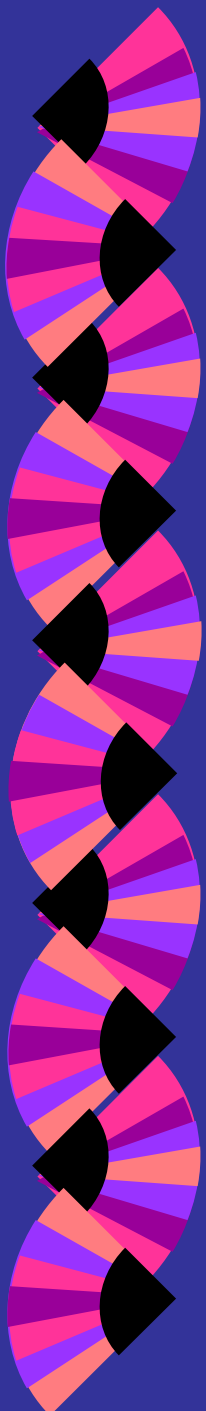
2.0% Severely Dysplastic



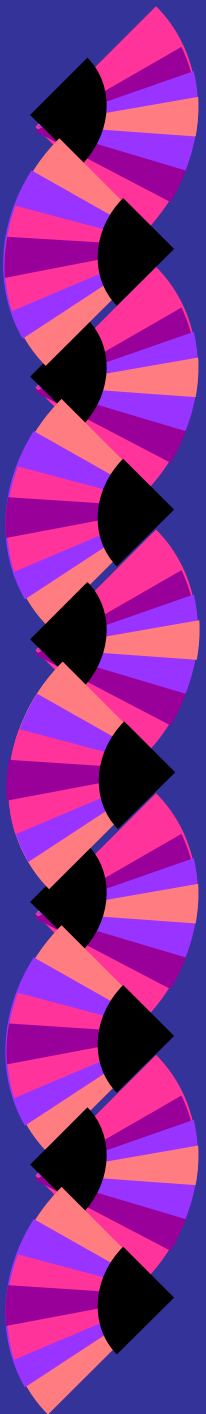
OFA Hip Statistics for the French Bulldog

Trends:

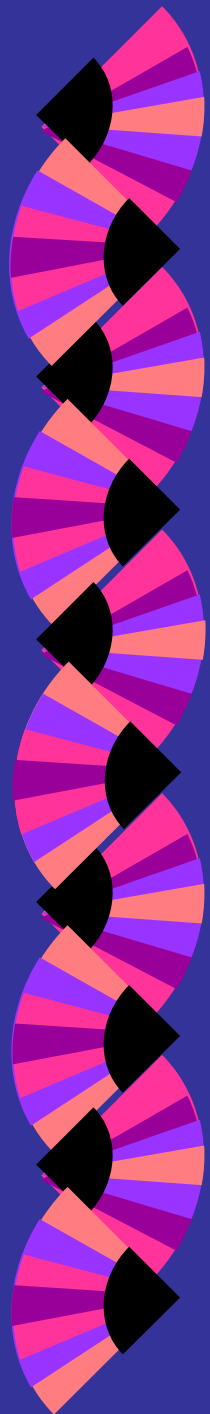
<u>Range</u>	<u># submitted</u>	<u>Excellent</u>	<u>Dysplastic</u>
Prior '80	2	0.0%	0.0%
'90-'92	17	0.0%	35.3%
'00-'02	152	2.0%	35.5%
'03-'04	131	2.3%	35.1%



Patella Luxation



Patella Luxation

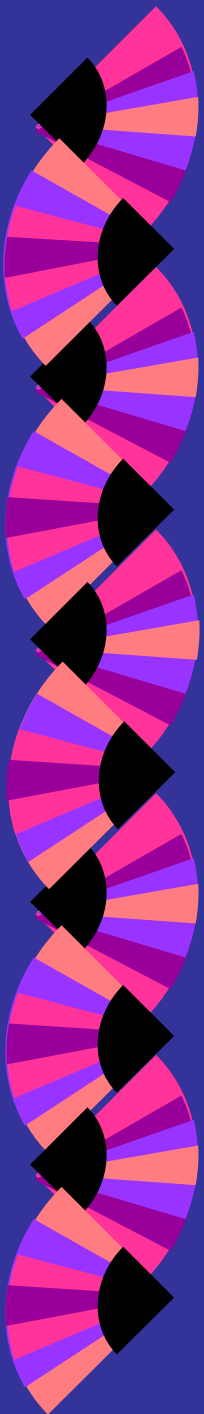


OFA Patella Statistics for the French Bulldog

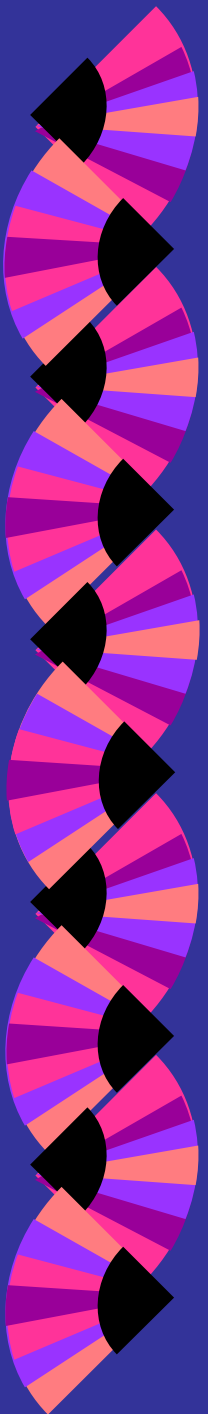
Rank #35/87 (686 evaluations)

95.6% Normal

4.4% Affected (30 dogs)



Elbow Dysplasia



OFA Elbow Statistics for the French Bulldog

Rank #65/95 (212 evaluations)

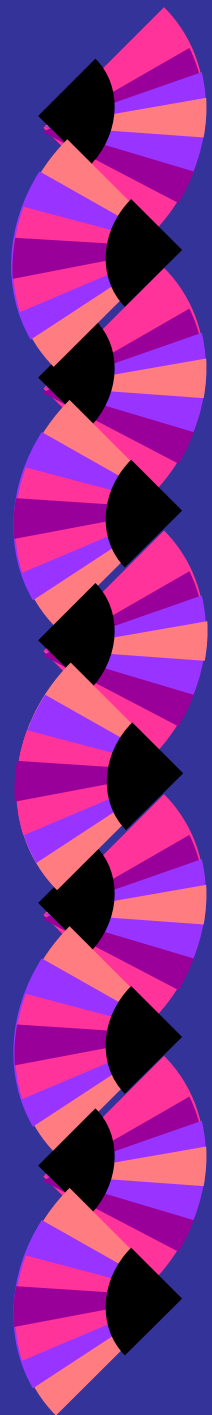
93.4% Normal

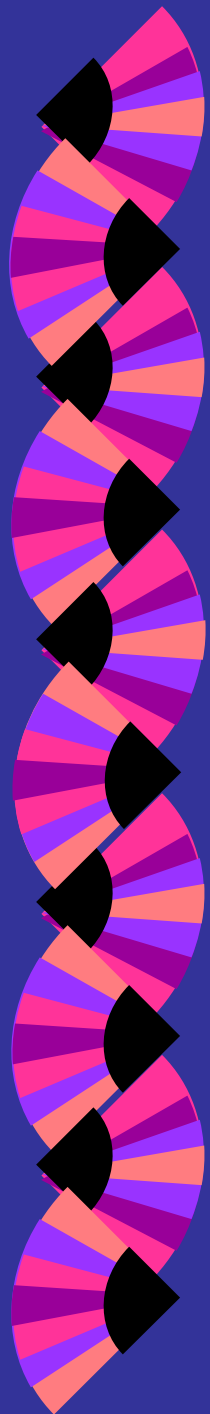
2.8% dysplastic:

2.4% Grade I (5 dogs)

0.0% Grade II (0 dogs)

0.5% Grade III (1 dog)





CERF

Canine Eye Registration Foundation

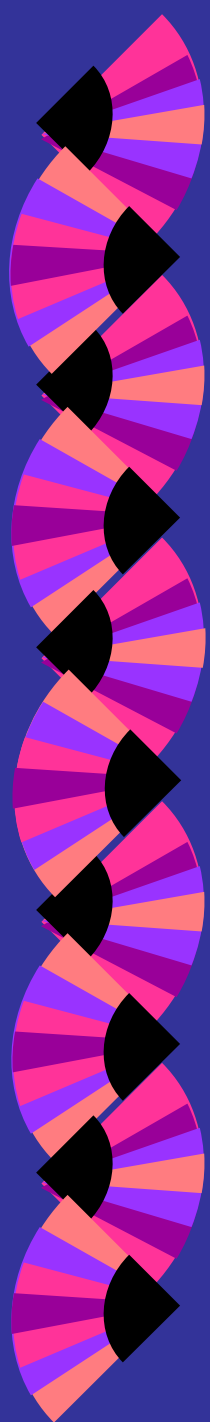
Ocular Disorders in the French Bulldog

(Based on CERF Examination of 733 dogs examined)

DISORDER

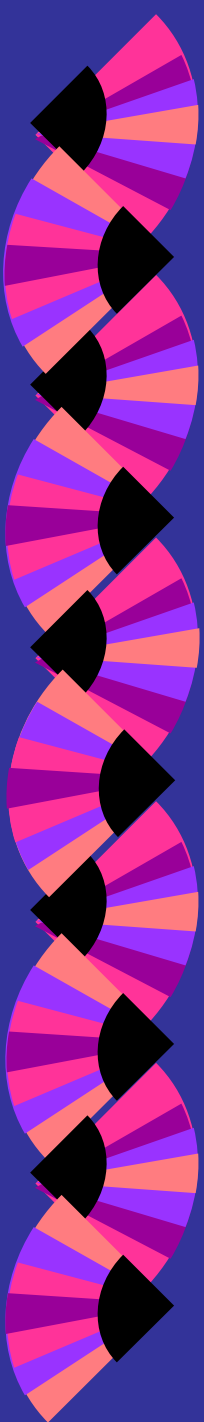
CERF (2000-2005)

- | | | |
|--------------------------------------|-------|------|
| • Distichiasis | 6.96% | (51) |
| • Persistent Pupillary Membrane | 4.50% | (33) |
| • Cataract (1° Ant. Cortex Punctate) | 2.46% | (18) |
| • Persistent Pupillary Membrane | | |
| • (Iris to Cornea) * | 2.32% | (17) |
| • Retinal Dysplasia | 2.05% | (15) |
| • Entropion | 1.36% | (10) |



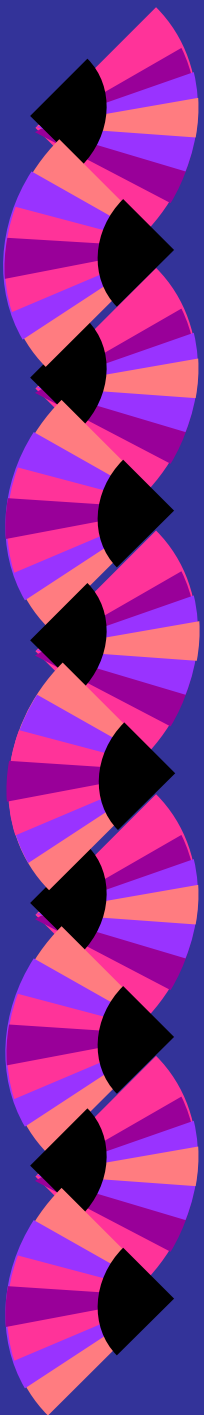
Juvenile Hereditary Cataract in the French Bulldog

- Autosomal recessive inheritance
- Bilateral nuclear and cortical cataracts
- Average age of onset around 3 months of age
- Identified in 2.46% of French Bulldogs CERF examined between 2000-2005
- Genetic Test is available from AHT: Early test results (skewed sample of 87 French Bulldogs):
 - 61 Normal (70.1%)
 - 25 Carrier (28.7%)
 - 1 Affected (1.2%)



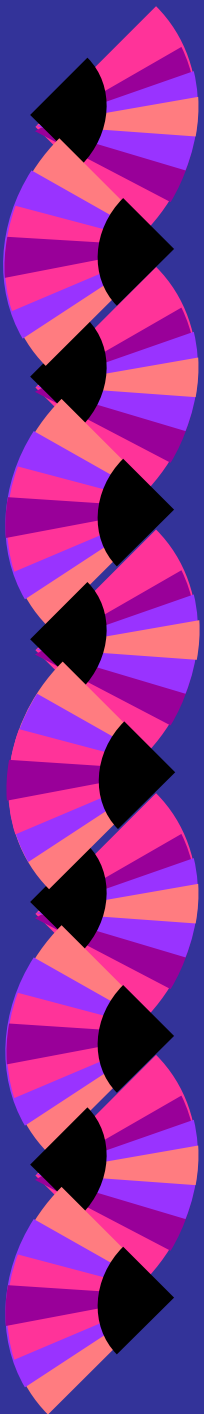
Hereditary Cataract in the French Bulldog

- ◆ A posterior polar cataract occurs in the French Bulldog breed that is different genetically from the nuclear cataract
 - ◆ Unknown mode of inheritance
 - ◆ Genetic test all dogs (including those with cataracts) to determine which cataract is present
- ◆ I.e., at least two inherited cataract conditions in the breed
- ◆ Submit cheek swabs and CERF exam form to AHT for all affected dogs (tested at no charge)



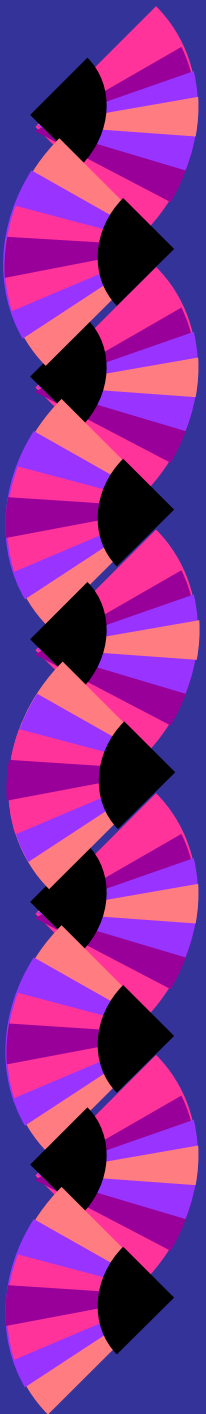
Hypothyroidism in the French Bulldog

- Diagnosis of autoimmune thyroiditis
 - not just thyroid responsive conditions
- **Dogs with measurable antibodies are affected**
- 1.1% French Bulldogs tested by Michigan State University are positive for thyroid autoantibodies (357 samples submitted)
- Average for all breeds = 7.5%



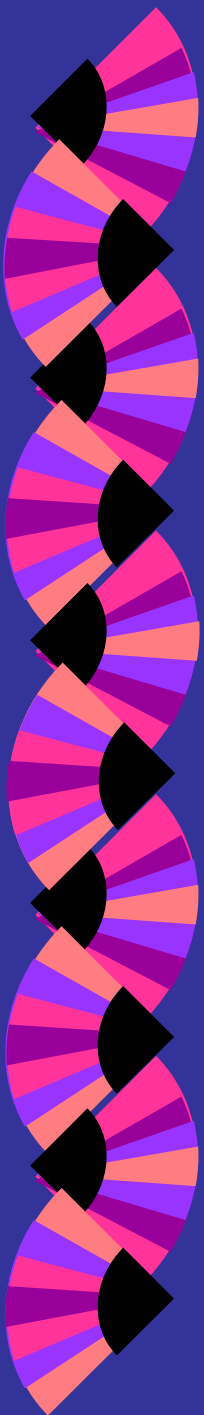
Degenerative Myelopathy in the French Bulldog

- ◆ Disorder of neurological degeneration of the spinal cord in older French Bulldogs
- ◆ Causes weakness and sinking of hind legs
- ◆ Not a painful condition
- ◆ No effective treatment is available



Degenerative Myelopathy in the French Bulldog

- ◆ A genetic test is available from the OFA for an autosomal recessive DM susceptibility gene
 - ◆ 7 French Bulldogs Tested
 - ◆ 2 test normal
 - ◆ 3 test as carriers of the susceptibility gene
 - ◆ 2 test homozygous “at risk” of developing DM
 - ◆ DM test result is not a predictor of who will develop DM, just who will not develop DM, and who is at risk



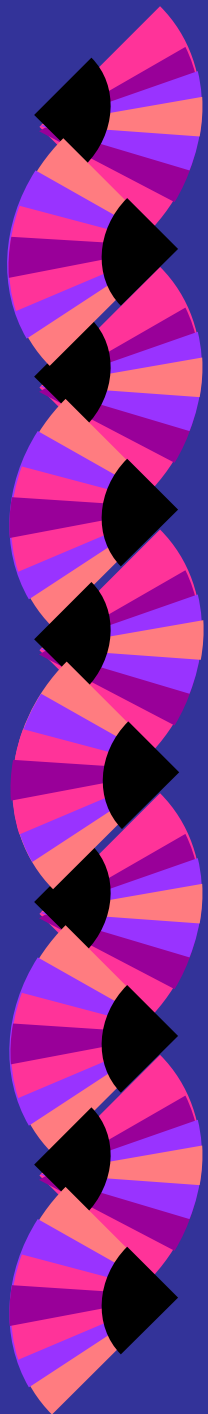


*Advancing the health of all breeds
through DNA collection for research.*

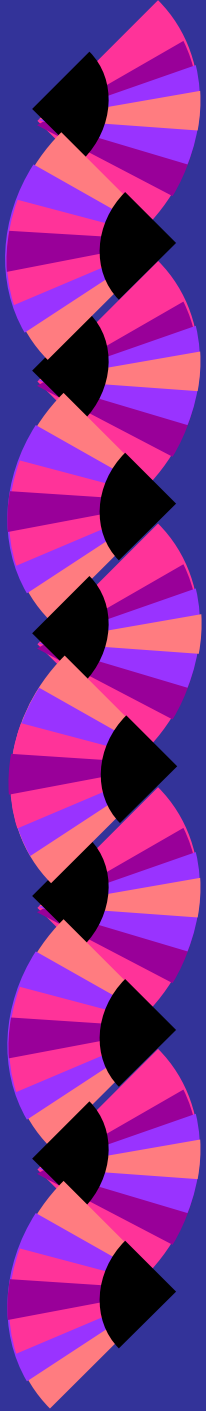
**Banking On The Future of
Your Breed**

131 French Bulldog Samples in the
DNA Repository

Who is a Reputable Breeder?



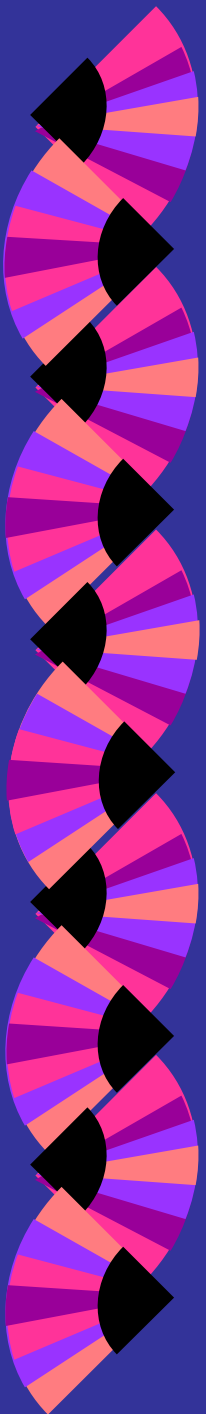
One That Does Genetic Testing



Breeders are the custodians of their breeds, and their gene pool.

- ◆ Above all, do no harm.
- ◆ Breeders must be counseled to use genetic tests for the best interests of their breed.

Managing Genetic Disease





Many Breeders Use the

HGH

*Method of Genetic
Disease Control*

HOPE for GOOD HEALTH



What is the most important concern of the public on purchasing a puppy?

It's Health

What is the Expectation of the General Public?



**That Quality Control for Genetic Disease
is Already Being Done**



Responsibility

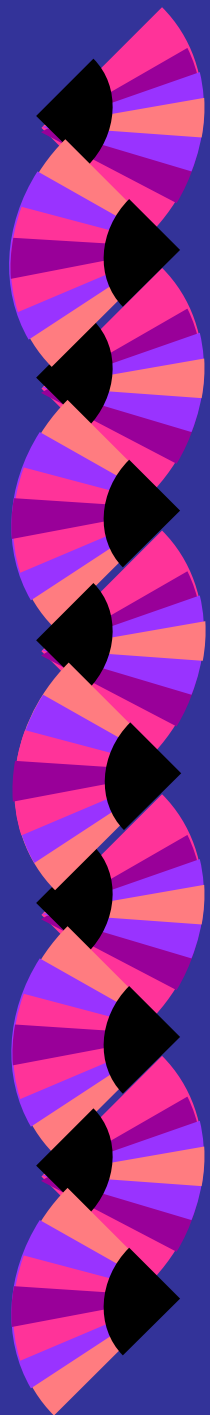
Duty, Obligation, Burden

**What is the responsibility of the breeder
Regarding the genetic health of dogs?**

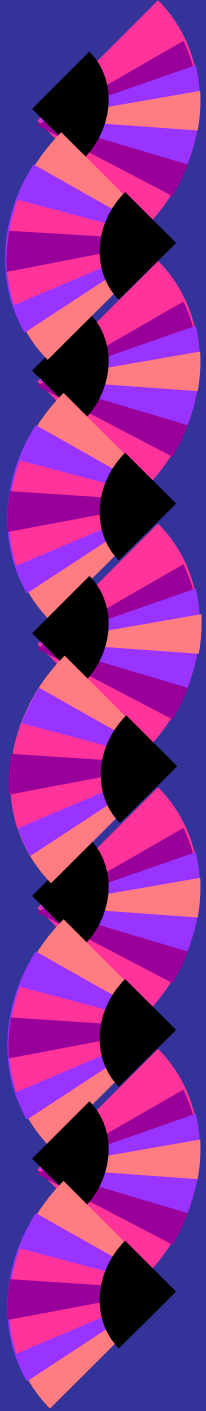


*What is the only way to positively select
for genetically healthy offspring?*

**The selection of genetically healthy
parents through genetic testing**

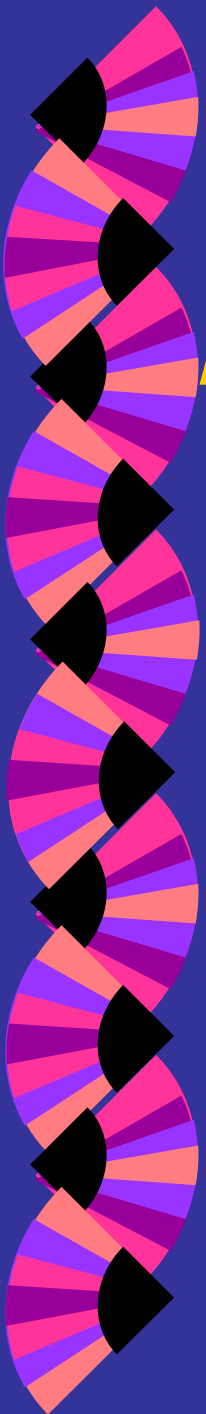


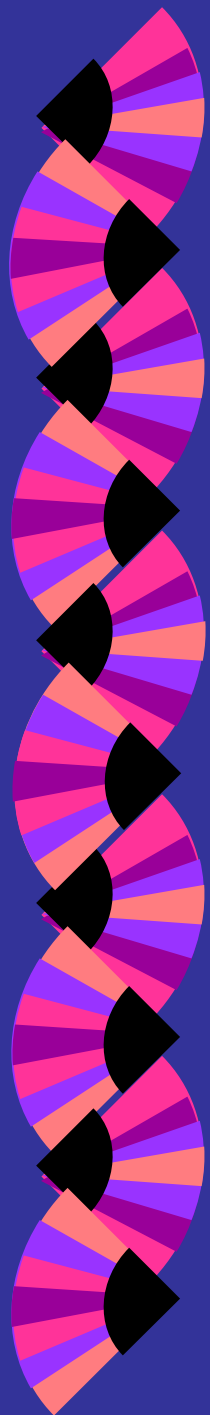
- ◆ **Tests of the genotype: Direct DNA tests for liability genes**
- ◆ **Tests of the phenotype: Tests to primarily identify clinically affected individuals**
- ◆ **Pedigree analysis: Identification of carrier risk based on the knowledge of carrier and affected relatives**



It is the ethical responsibility and obligation of all breeders to perform the available required pre-breeding genetic health tests on prospective breeding stock prior to any breeding

All genetic disease cannot be prevented. However, we have the knowledge and the tools to improve the genetic health of puppies.





**Many health tests can be performed
during an examination with your
veterinarian, or obtained
inexpensively at local health
screening clinics**

OFA Health Clinic Calendar

Click on a location/date to view event details.

Want to submit your club's health clinic? [Click here for Clinic Submission Instructions.](#)

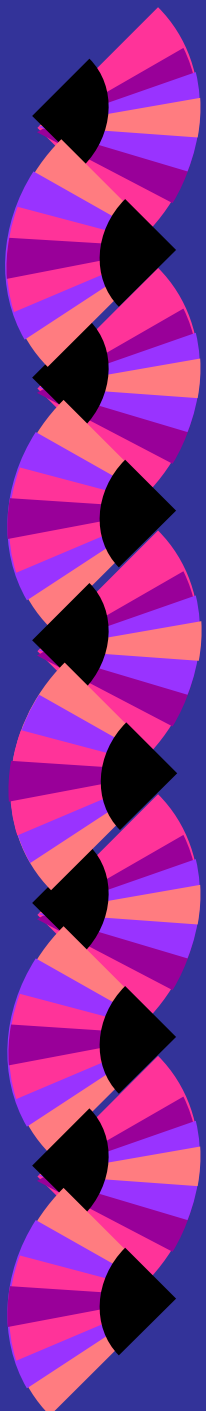
OFA Health Clinics

Today ◀ ▶ September 2009 ▼ Print Week Month Agenda ▼

Sun	Mon	Tue	Wed	Thu	Fri	Sat
30 Bellville, MI	31	Sep 1	2	3	4	5 Denver, CO Greeley, CO Raleigh, NC
6	7	8	9	10	11	12
13 Davenport, IA	14	15	16 Windsor, CO	17 North Stonington,	18 Helena, MT North Stonington,	19 Carlisle, PA Ft. Collins, CO Hickory, NC
20 Johnsburg, IL Malvern, PA	21	22	23	24	25	26 Grand Junction, CO
27 Centerville, MD Grand Junction, CO S Suffield, CT Topsham, ME Waterloo, Ont. Ca	28	29	30	Oct 1	2	3

Events shown in time zone: Central Time + [Google Calendar](#)

www.offa.org/clinics.html





INSIDE TOPICS

- Breeders
- Questions For Breeders
- Breeders' Excuses
- Books
- Diets
- Health Clinics
- Overview
- Rescue
- RESOURCES
- SM MRI Screening
- Stenotic Nares
- Syncope
- Syringomyelia
- Syringohydromyelia (SHM)
- Syrinx
- Thrombocytopenia
- Thyroid Disorders
- Thyroiditis
- Vision Disorders

Dog/Canine Health Test Clinic Schedule

in the United States and Canada

Updated September 7, 2009 – 179 Clinics Listed!

How to Find Clinics on this Site

Table 1: Clinic Locations (Newest Listings in **RED**)

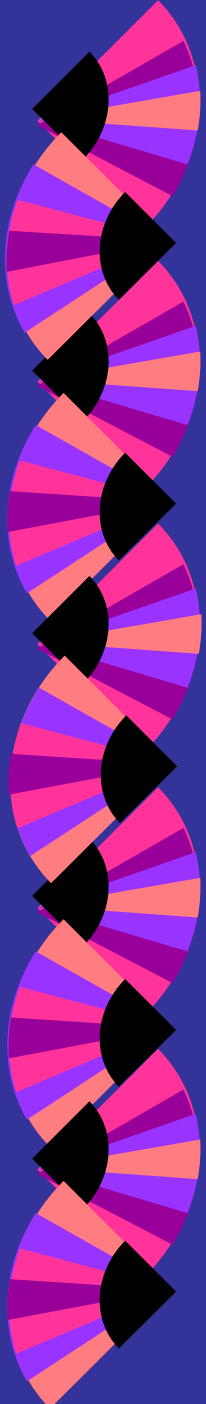
Table 2: Clinic Dates & Details

Table 1: State/Province, City, and Date (Latest Update in **RED)**

Symbols for tests:

Heart (Cardiac) ♥; Eyes 👁; Hearing 👂; Blood/Swabs 🩸; X-rays ✕; Other tests +; Microchip 📡

STATE/PROV	CITY	DATE	TESTS
AB	Edmonton	9/12-13/09	👁
AZ	Gilbert	10/6/09	👁
"	"	11/3/09	👁
"	"	12/1/09	👁
"	"	1/5/10	👁
"	"	2/2/10	👁
"	"	3/2/10	👁
"	Tucson	10/7/09	👁
"	"	11/4/09	👁
"	"	12/2/09	👁
"	"	1/6/10	👁
"	"	2/3/10	👁
"	"	3/3/10	👁
BC	Abbotsford	10/29/09	👁
"	Cobble Hill	10/4/09	👁
"	Prince George	9/12/09	👁
CA	Bloomington	10/5/09	👁
"	Carmel*	1/16/10	♥👁
"	Del Mar	10/10-11/09	♥
"	Dixon	10/23-25/09	♥





Tests of Genotype:

- ◆ PCR tests
- ◆ Linkage based tests

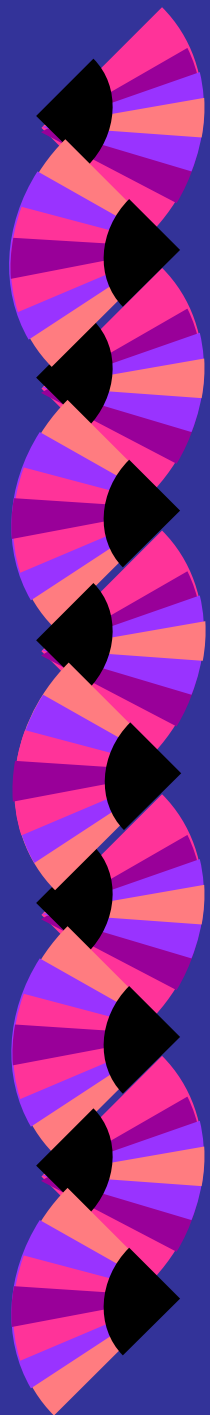
Tests of Phenotype:

- ◆ Hip exams, thyroid autoantibodies, BAER hearing test, ausculting/ultrasound exams, behavioral traits, biopsy...



Management Recommendations will vary due to many factors

- ◆ Mode of Inheritance
- ◆ Available Genetic Tests
- ◆ Spread of defective gene(s)
- ◆ Breed Pool Size and Diversity



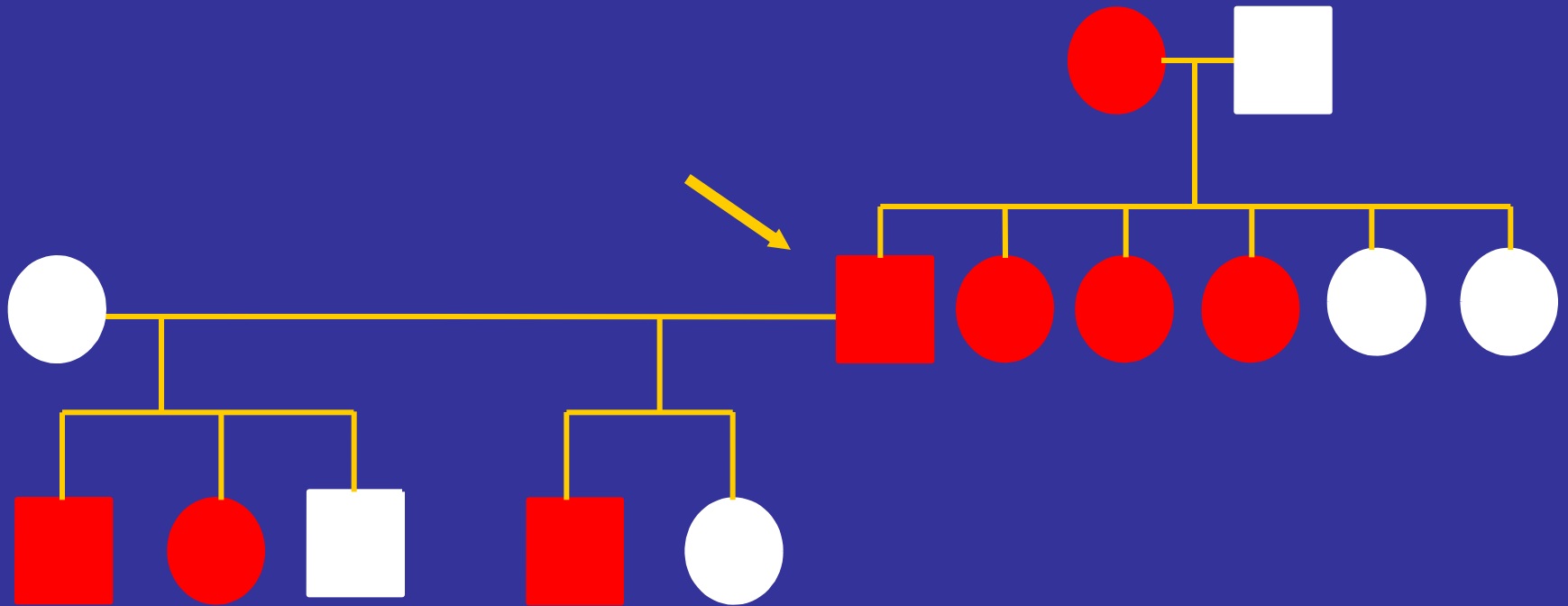
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ᠨᠢ	ᠨᠣ	ᠨᠠ	ᠨᠡ	ᠨᠢ	ᠨᠣ	ᠨᠠ
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ᠨᠠ	ᠨᠡ	ᠨᠢ	ᠨᠣ	ᠨᠠ	ᠨᠡ	ᠨᠢ
ᠨᠡ	ᠨᠢ	ᠨᠣ				ᠨᠤ
ᠨᠢ	ᠨᠣ	ᠨᠠ				



Managing Dominant Genes

- ◆ Ex) Ehlers-Danlos syndrome, Goiter, Lymphedema, some Cataracts, Mastiff PRA.
- ◆ Replace affected breeding dogs with normal siblings, parent, or prior-born offspring.
- ◆ Ideally don't want to breed and produce more affected dogs.

Managing Dominant Genes



■ Male ● Female □ Normal ■ Affected



Managing Recessive Genes

- ◆ Ex) storage diseases, Von Willibrand's disease,, Cranomandibular Osteopathy (CMO), CMR.

With tests for carriers:

- ◆ Breed carriers to genetically normal mates.
- ◆ Replace carrier parents with genetically normal offspring.
- ◆ Select against carriers for breeding.



Types of Matings with an Autosomal Recessive Defect

Normal x Carrier = 50% Normal 50% Carrier

Normal x Affected = 100% Carrier

Carrier x Carrier = 25% Normal 50% Carrier
25% Affected

Carrier x Affected = 50% Carrier 50% Affected

The Gene Hunt

Scientists launch a \$3 billion project to map the chromosomes and decipher the complete instructions for making a human being

By LEON JAROFF

...know that about... the story...
...will be the word...
...Knox... from



In an obscure corner of the National Institutes of Health, molecular biologist Norton Zinder sat at a 30-ft-long oval conference table, sat down and tapped his pencil for order. A hash settled over the Human Genome Advisory Committee, an unlikely assemblage of computer experts, biologists, ethicists, industry scientists and engineers. "Today we begin," chairman Zinder declared. "We are initiating an arduous study of human biology. Whatever it's going to be, it will be an adventure, a prismatic endeavor. And when it's done, someone else will sit down and say, 'It's time to begin.'"

With these words, spoken in January, Zinder formally launched a monumental effort that could rival in scope both the Manhattan Project, which created the A-bomb, and the Apollo moon-landing program—and may exceed them in importance. The goal: to map the human genome and spell out for the world the entire message hidden in its chemical code.

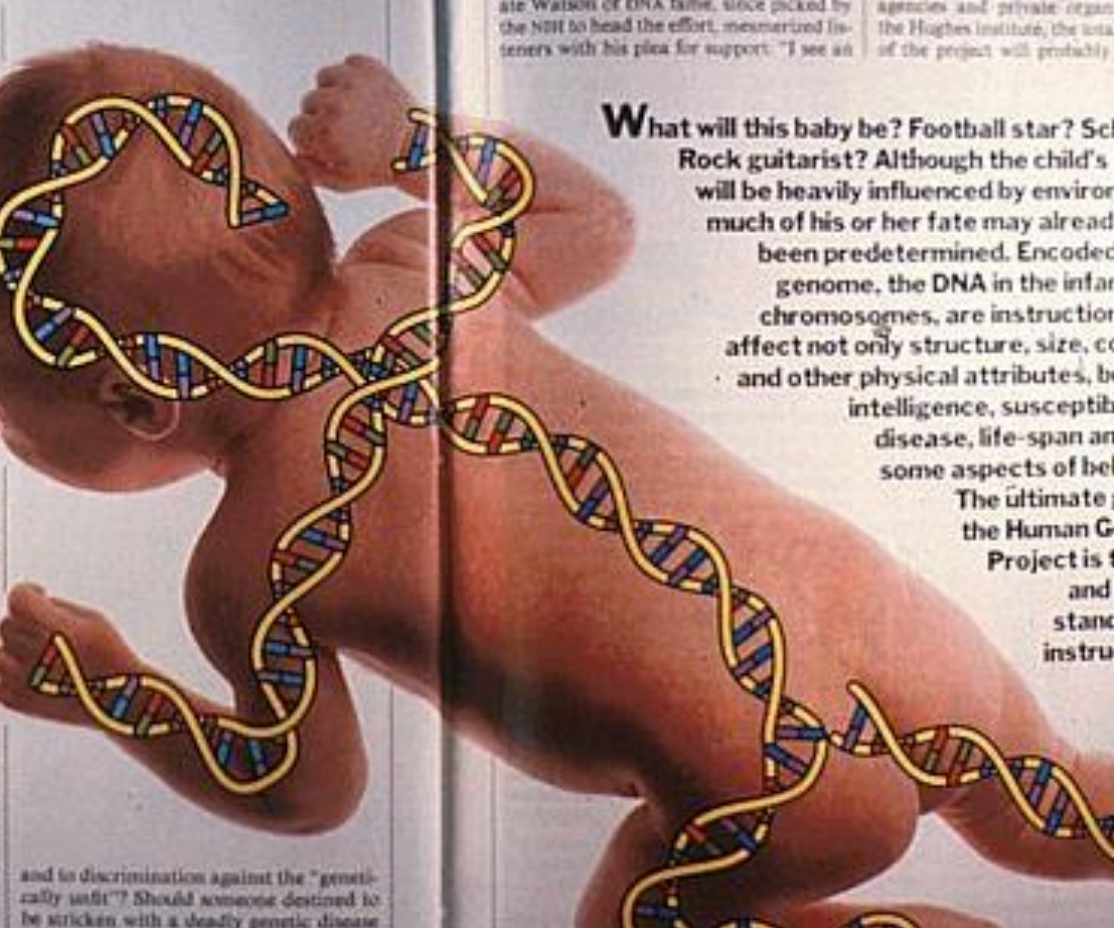
Genome? The word evokes a blank stare from most Americans, whose taxes will largely support the project's estimated \$3 billion cost. Explains biochemist Robert Simshammer of the University of California at Santa Barbara: "The human genome is the complete set of instructions for making a human being." Those instructions are tucked into the nucleus of each of the human body's 100 trillion cells and written in the language of deoxyribonucleic acid

and a huge coordinated effort, the genome project can reach its goal in 15 years.

The achievement of that goal would launch a new era in medicine. James Wyngaarden, director of the NIH, which will oversee the project, predicts that it will make "major contributions to understanding growth, development and human health, and open new avenues for therapy." Full translation of the genetic message would enable medical researchers to identify the causes of thousands of still mysterious inherited disorders, both physical and behavioral.

With this insight, scientists could more accurately predict an individual's vulnerability to such obviously genetic diseases as cystic fibrosis and could eventually develop new drugs to treat or even prevent them. The same would be true for more common disorders like heart disease and cancer, which at the very least have large genetic components. Better knowledge of the genome could speed development of gene therapy—the actual alteration of instructions in the human genome to eliminate genetic defects.

The NIH and the Food and Drug Administration have already taken a dramatic step toward gene therapy. In January they gave approval to Dr. W. French Anderson and Dr. Steven Rosenberg, both at the NIH, to transplant a bacterial gene into cancer patients. While this gene is intended only to make it easier for doctors to monitor an experimental cancer



Mark Pearson, Du Pont's director of molecular biology. Predicts George Cahill, a vice president at the Howard Hughes Medical Institute: "It's going to tell us everything. Evolution, disease, everything will be based on what's in that magnificent tape called DNA."

That kind of enthusiasm is infectious. In an era of budgetary restraint, Washington has been unflinchingly generous toward the genome project, especially since last April, when an array of scientists testified on the subject at a congressional committee hearing. There, Nobel laureate Watson of DNA fame, since picked by the NIH to head the effort, mesmerized listeners with his plea for support: "I see an

Congress rose to the... promptly allocated more than... for genetic research to the... Department of Energy and... Library of Medicine, which... volved in the quest. The com... prations rose to \$55 million... 1989.

Even more will be needed... effort is in full swing, involv... of scientists, dozens of Govern... versity and private laborator... tral computer and data co... ntributions from other a... gencies and private organ... the Hughes Institute, the... of the project will probably...

What will this baby be? Football star? Sc... Rock guitarist? Although the child's... will be heavily influenced by environ... much of his or her fate may already... been predetermined. Encoded... genome, the DNA in the infan... chromosomes, are instruction... affect not only structure, size, co... and other physical attributes, b... intelligence, susceptibi... disease, life-span an... some aspects of beh...
The ultimate... the Human G... Project is t... and... stand... instru...

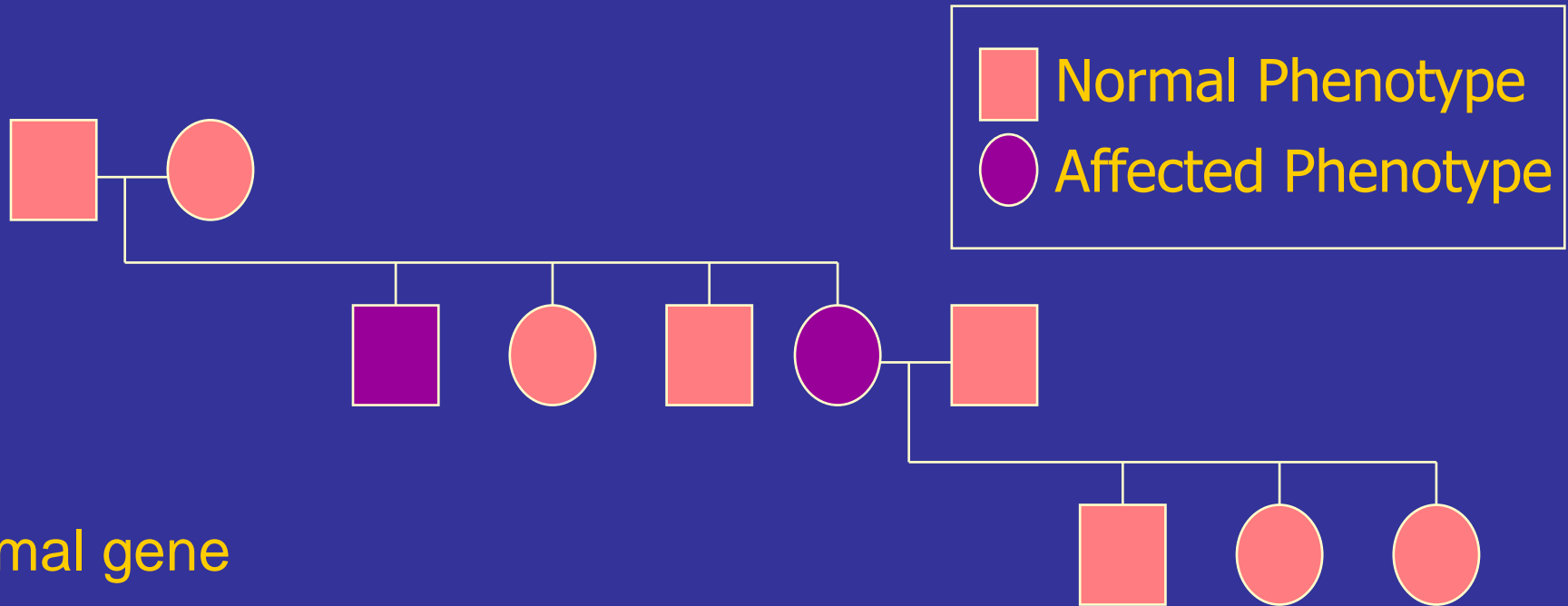
and to discrimination against the "genetically unfit"? Should someone destined to be stricken with a deadly genetic disease



Identifying defective genes I

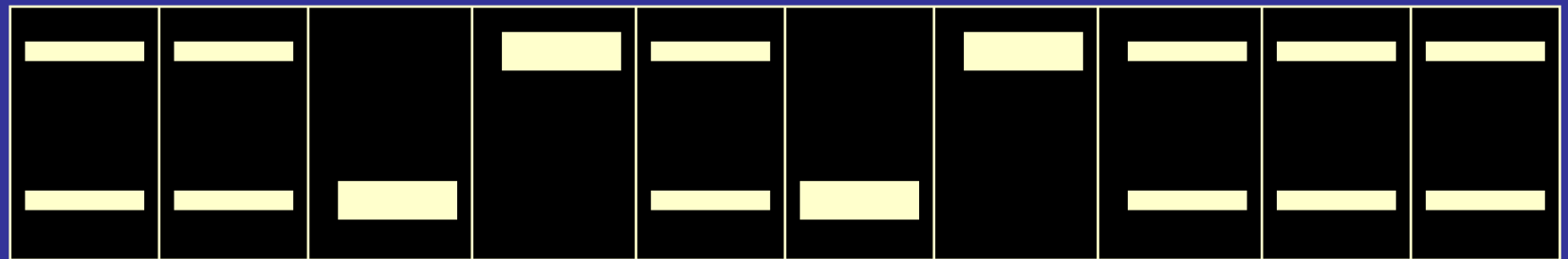
- ◆ Candidate Gene Approach: Search for abnormalities in genes known to be involved in the defective system: peripherin & rhodopsin in PRA, dystrophin in Muscular Dystrophy

PCR Analysis of Recessive Disease



Normal gene

Defective gene



Direct Gene Tests

- 
- ◆ Canine Leukocyte Adhesion Deficiency (Irish Setter)
 - ◆ Choroidal Hypoplasia (Collie Eye Anomaly) (Australian Shepherd, Border Collie, Nova Scotia Duck Tolling Retriever, Collie, Shetland Sheepdog)
 - ◆ Congenital Stationary Night Blindness (Pointer)
 - ◆ Cystinuria (Newfoundland)
 - ◆ Fucosidosis (English Springer Spaniel)
 - ◆ Globoid Cell Leukodystrophy (Cairn Terrier & Westies)
 - ◆ Glycogenolysis Type IV (Norwegian Forest Cat)
 - ◆ GM-1 Gangliosidosis (Portuguese Water Dog)
 - ◆ Ivermectin Sensitivity (Collies and other breeds)
 - ◆ Juvenile Cataract (Boston Terrier, French Bulldog, Staffordshire Bull Terrier)
 - ◆ Mucopolysaccharidosis (German Shepherd Dog)
 - ◆ Myotonia Congenita (Miniature Schnauzer)
 - ◆ Narcolepsy (Dachshund, Doberman & Labrador Ret.)

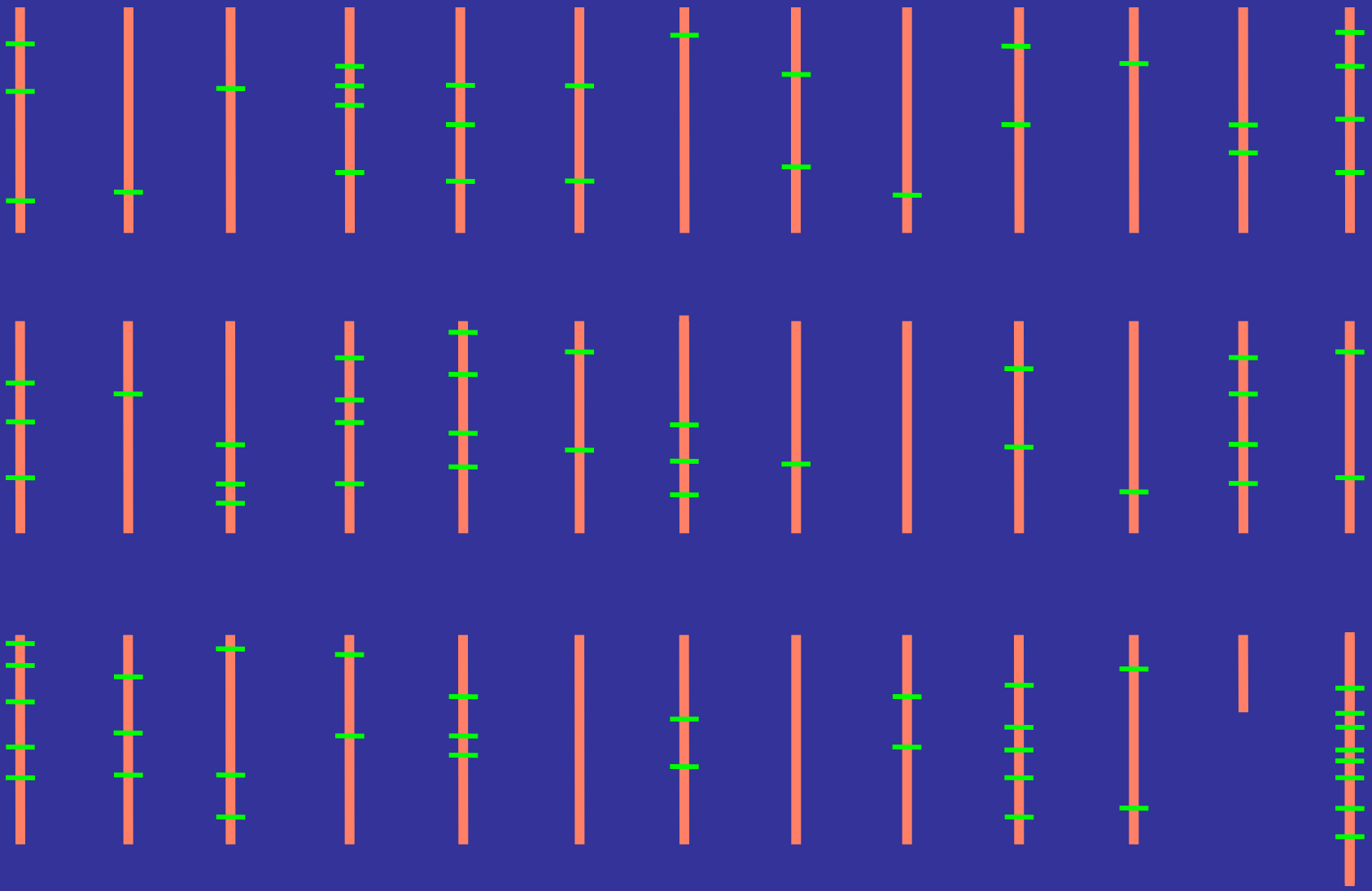
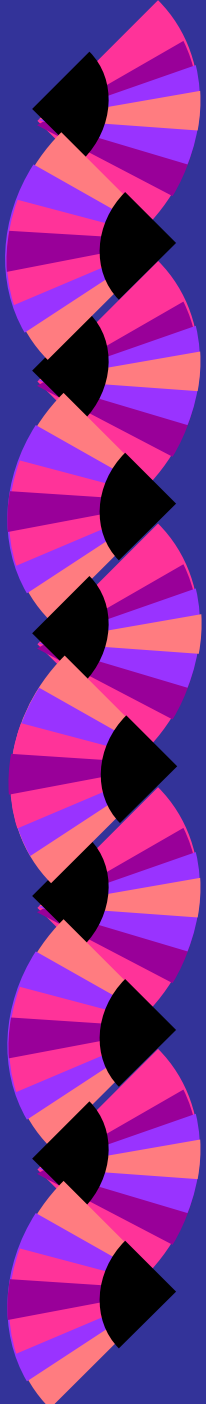
Direct Gene Tests

- 
- ◆ Phosphofructokinase deficiency (Am. Cocker & Eng. Springer Spaniels)
 - ◆ Progressive Retinal Atrophy (American Cocker Spaniel, BullFrench Bulldog, Cardigan Welsh Corgi, English French Bulldog, Irish Setter, Irish & White Setter, Miniature Schauzer, Nova Scotia Duck Tolling Retriever, Samoyed, Siberian Husky, Sloughi)
 - ◆ Pyruvate Kinase Deficiency (Abyssinian Cat, Basenji, Dachshund, DSH, English Springer Spaniel, Somali Cat, West Highland White Terrier)
 - ◆ Severe Combined Immunodeficiency (Basset Hound, Welsh Corgi)
 - ◆ Von Willibrand's Disease (Bernese Mountain Dog, Doberman Pinscher, Drentsche Patrijshound, Manchester Terrier, Pembroke Welsh Corgi, Pointer, Scottish Terrier, Shetland Sheepdog)

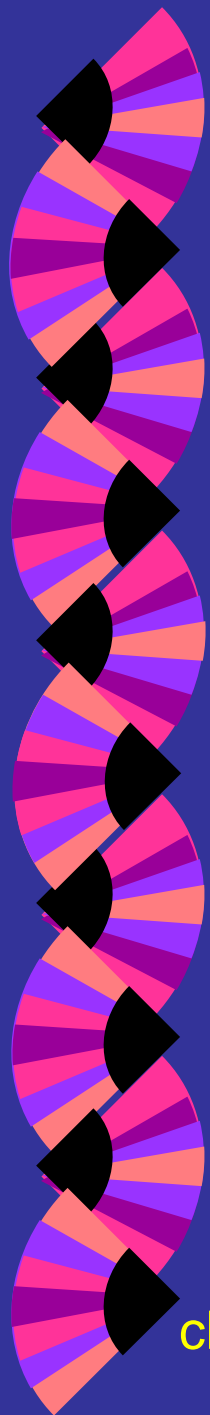


Identifying defective genes II

- ◆ Linkage analysis: Search for positive linkage to polymorphic markers; identifying high probability areas for a defective gene on a chromosome map



Genetic Crossover During Meiosis



Disease gene

Linked marker

Sire's
chromosome

Normal gene

No marker

Dam's
chromosome

Disease gene

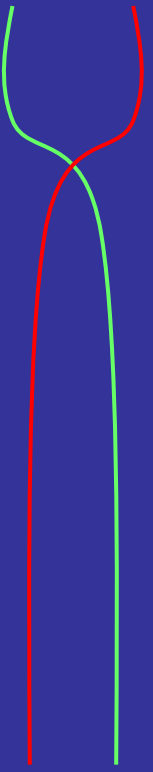
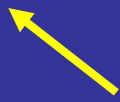
No marker

False-negative
result

Normal gene

Linked marker

False-positive
result

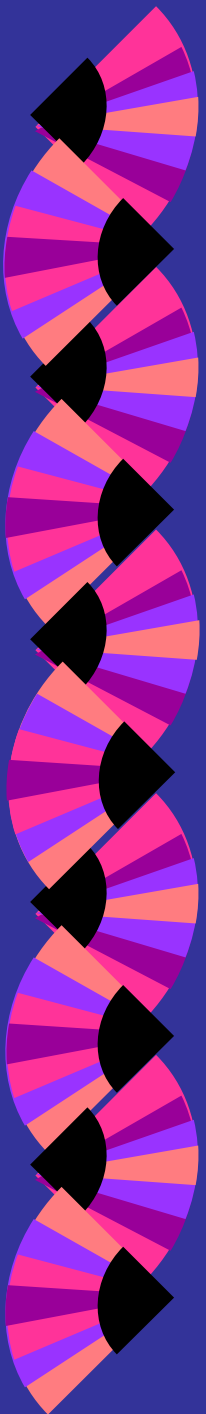


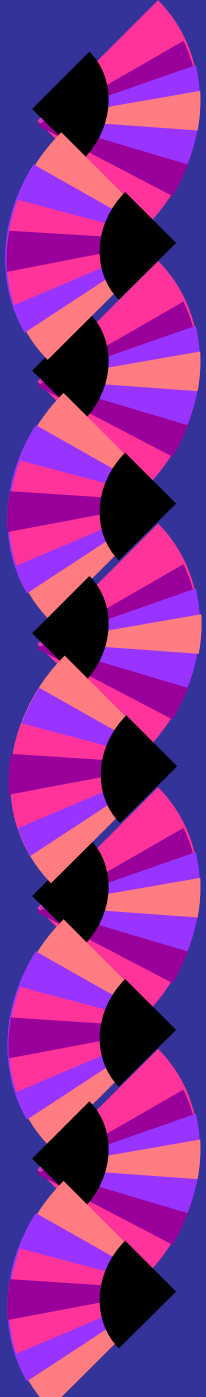
Linked Marker Tests

- ◆ Cardiomyopathy, Juvenile (Portuguese Water Dog)
- ◆ Fanconi Syndrome (Basenji)
- ◆ Primary Hyperparathyroidism (Keeshond)
- ◆ Renal Dysplasia (Lhasa Apso, Shih Tzu, Soft Coated Wheaten Terrier)
- ◆ Trapped Neutrophil Syndrome (Border Collie)

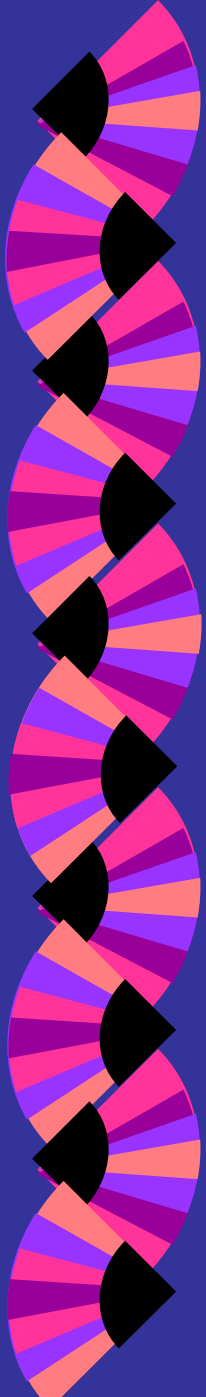
The Proper Use of Genetic Tests

- ◆ Without genetic tests, the effect on selection on the gene pool is minimal.
- ◆ With genetic tests, if everyone decides not to breed carriers, it can have a significant limiting effect on the gene pool.





If a breeder was planning on breeding an animal prior to receiving carrier test results, the PROPER RESPONSE is to breed to a normal individual and replace the parent with a normal offspring.



An individual is not an eye, a hip, or a heart. Each individual carries tens of thousands of genes, and each is part of the breed's gene pool.

Breeders must consider all aspects, such as health issues, conformation, temperament, and working ability.

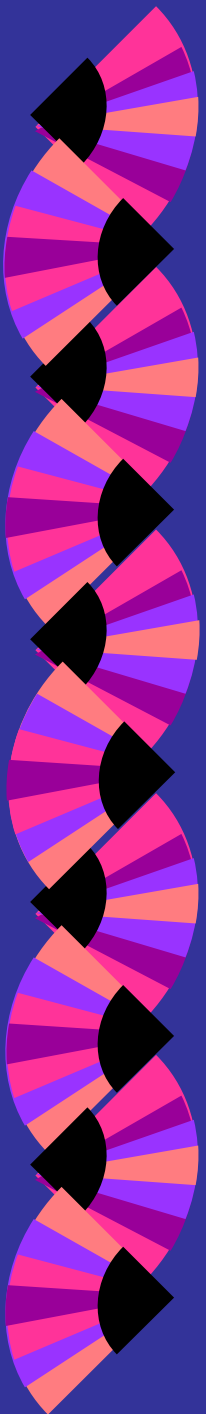
Making breeding decisions based on a single testable gene is inappropriate.

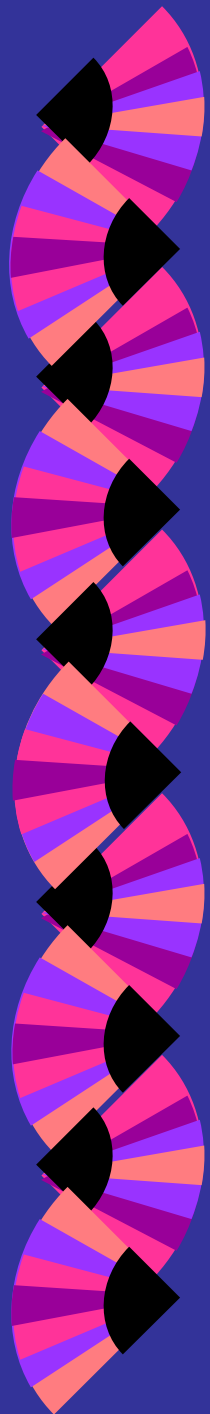


Without tests for carriers

- ◆ Breed higher risk individuals to lower risk individuals.
- ◆ Replace the higher risk individual with it's lower risk offspring.
- ◆ Repeat the process in the next generation.
- ◆ Requires (open) health databases

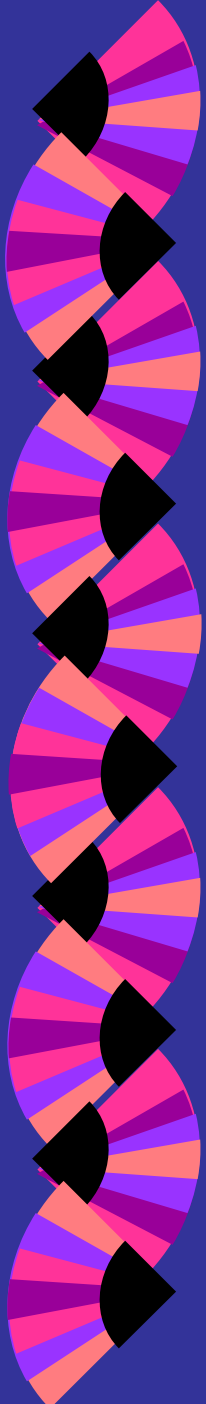
Genetic Registries






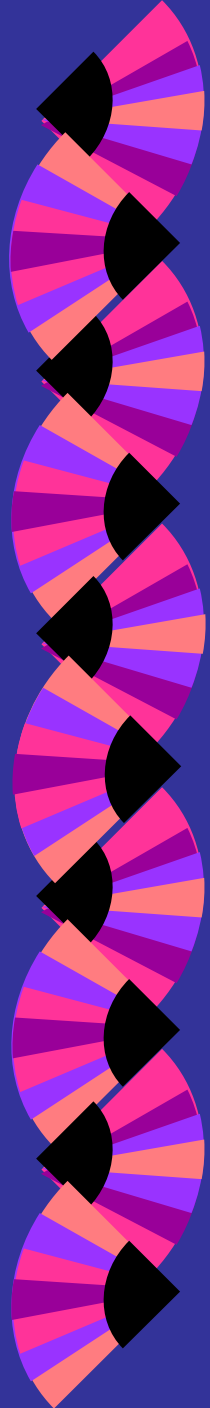
CERF

Canine Eye Registration Foundation



Orthopedic Foundation for Animals

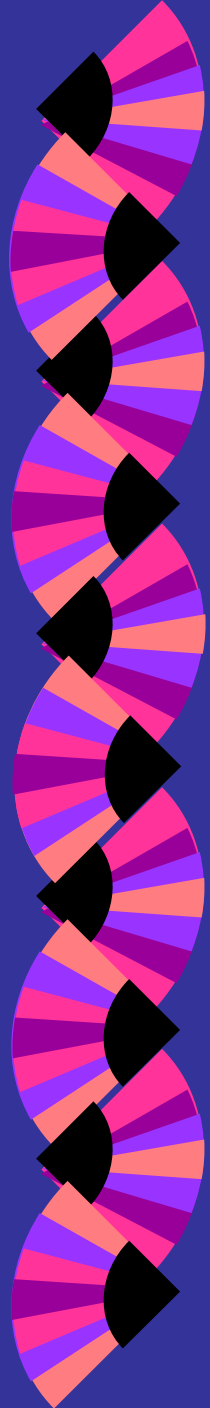
OFA number or Registration number:	<input type="text"/>	<input type="button" value="Begin Search"/>	<input type="button" value="Clear Search Items"/>
Part of Name:	<input type="text"/>	<input type="radio"/> First part of name (faster) <input type="radio"/> Any part of name (slower)	
Breed: Hold down the CTRL key to make multiple selections (To see all, don't select any)	Alapaha Blue Blood Bulldogs Affenpinscher Afghan Hound Airedale Terrier Akbash Dog Akita Alaskan Klee Kai Alaskan Malamute Alaskan Noble Companion Dog American Bandogge Mastiff American Bulldog American Canadian Herder	Show All breeds Show AKC-recognized breeds - AKC Sporting Group - AKC Hound Group - AKC Working Group - AKC Terrier Group - AKC Toy Group - AKC Non-Sporting Group - AKC Herding Group Show only cat breeds	
Variety:	<input type="text" value="-"/>		
CHIC Qualified:	<input type="checkbox"/> Check to see only CHIC Qualified dogs		
	<input type="checkbox"/> Check to see only dogs with pictures.		
Sex:	<input type="text" value="-"/>		
Date of birth:	<input type="text" value="-"/> <input type="text" value="-"/>	through	<input type="text" value="-"/> <input type="text" value="-"/>
	OR	<input type="text" value="-"/>	
Report type: Hold down the CTRL key to make multiple selections (To see all, don't select any)	Hips Elbow Cardiac Patella Thyroid Von Willebrand's	DNA Copper Toxicosis Stationary Night Blindness Factor VII Deficiency Cobalamin Malabsorption Collie Eye Anomaly Fucosidosis	<input type="radio"/> Animals having <i>any</i> of the selected reports <input type="radio"/> Animals having <i>each</i> of the selected reports (This also affects the ratings below)
Rating: Hold down the CTRL key to make multiple selections (To see all, don't select any)	Hips: Excellent Hips: Good Hips: Fair Hips: Borderline Hips: Mild Hips: Moderate		
Report date:	<input type="text" value="-"/> <input type="text" value="-"/>	through	<input type="text" value="-"/> <input type="text" value="-"/>
	OR	<input type="text" value="-"/>	
	<input type="button" value="Begin Search"/>	<input type="button" value="Clear Search Items"/>	



Search CHIC Breeds

CHIC number or registration number:	<input type="text"/>	<input type="button" value="Begin Search"/>	<input type="button" value="Clear Search Items"/>
Part of Name:	<input type="text"/>	<input type="radio"/> First part of name (faster) <input type="radio"/> Any part of name (slower)	
Breed:	<input type="text" value="—"/> ▾		
Variety:	<input type="text" value="—"/> ▾		
Sex:	<input type="text" value="—"/> ▾		
Date of birth:	<input type="text" value="—"/> ▾	<input type="text" value="—"/> ▾	through <input type="text" value="—"/> ▾ <input type="text" value="—"/> ▾
	OR <input type="text" value="—"/> ▾		
	<input type="button" value="Begin Search"/>	<input type="button" value="Clear Search Items"/>	

[CHIC information](#) | [CHIC FAQs](#) | [CHIC DNA Bank](#) | [CHIC breeds](#) | [search CHIC](#)
[contact us](#)





- ◆ Open health database for breeds.
- ◆ Included disorders and means of diagnoses are determined by each national breed club.
- ◆ Animals can receive CHIC certification based on completing the required genetic testing, **REGARDLESS** of normal or abnormal outcomes.
- ◆ As more testable disorders emerge, every individual is likely to carry some deleterious genes.



Not about health normalcy

About health consciousness

Breeds Requirements

French Bulldog [\(search\)](#)

Hip Dysplasia

- [OFA](#) evaluation
- [OVC](#) evaluation
- [PennHip](#) evaluation
- [GDC](#) evaluation

Eye Clearance

- [CERF](#) evaluation
Annual recertification recommended

Patellar Luxation

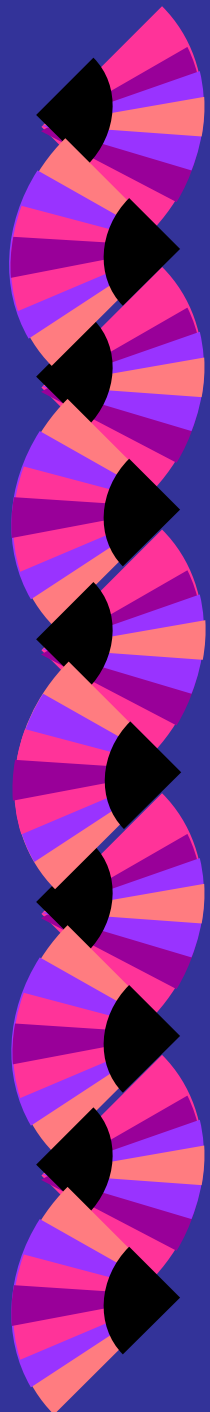
- [OFA](#) evaluation

Autoimmune thyroiditis (Optional)

- OFA evaluation from an [approved laboratory](#)

Congenital Cardiac Database (Optional)

- [OFA](#) evaluation



AUTUMN RUN'S BETTER ON ICE CHIC

Registration: NP04828901 (AKC) **Sire:** NM84628201
Breed: FRENCH BULLDOG **Dam:** NM93767801
Sex: M ***Titles:**
Color: BRINDLE & WHITE **CHIC #:** 26933
Birthdate: Dec 2 2003 **Addtl. Reg. #**
DNA Profile:



OFA Number	Registry	Test/Film Date	Report Date	Age	Final Conclusion
FBU-CA253/19M/C-PI	CARDIAC	Jul 16 2005	Aug 2 2005	19	NORMAL - CARDIOLOGIST
FBU-PA340/19M/S-PI	PATELLA	Jul 18 2005	Aug 2 2005	19	NORMAL - SPECIALIST
FBU-229G24M-PI	HIPS	Dec 2 2005	Dec 22 2005	24	GOOD
FBU-EL132M24-PI	ELBOW	Dec 2 2005	Dec 22 2005	24	NORMAL
FBU-TH48/24M-PI	THYROID	Dec 2 2005	Jan 27 2006	24	NORMAL
FBU-612	CERF	Apr 1 2006	Apr 1 2006 *	28	TESTED: 05,05,06

* CERF Certification is valid for one year from the date of the exam.

Sire/Dam	Registration	Birthdate	Sex	Relation	CARDIAC	ELBOW	CERF	HIPS	PATELLA	THYROID
<u>AUTUMN RUN'S ONEDERBULL</u> CHIC	NM84628201	Oct 3 1999	M	Sire	FBU-CA105/21M/C-PI	FBU-EL45M24-PI	FBU-417	FBU-83G24M-PI	FBU-PA161/23M/P-PI	FBU-TH14/51M-PI
<u>BELBOULECAN DANISH BY DESIGN</u> CHIC	NM93767801	Dec 27 2001	F	Dam	FBU-CA184/27F/C-PI	FBU-EL83F24-PI	FBU-534	FBU-145G24F-PI	FBU-PA256/24F/S-PI	FBU-TH35/24F-PI

Half Siblings(Dam)	Registration	Birthdate	Sex	Relation	CARDIAC
<u>AUTUMN RUN'S MADE YOU LOOK AT NUVO</u>	NP09125802	Jan 25 2005	F	Half(Dam)	FBU-CA441/31F/C-PI

KAE-RAE ROEMERS MONET OF LAS ALLE CHIC

Registration: NP02165403 (AKC)

Sire: NM91714804

Breed: FRENCH BULLDOG

Dam: NM87378002

Sex: M

***Titles:** CH

Color: CREAM

CHIC #: 30272

Birthdate: Dec 11 2002

Addtl. Reg. #



DNA Profile:

OFA Number	Registry	Test/Film Date	Report Date	Age	Final Conclusion
FBU-633	CERF	Jun 6 2005	Jun 6 2005 *	30	TESTED: 05
FBU-CA262/31M/C-PI	CARDIAC	Jul 16 2005	Sep 1 2005	31	NORMAL - CARDIOLOGIST
FBU-PA376/35M/P-PI	PATELLA	Nov 28 2005	Dec 29 2005	35	NORMAL - PRACTITIONER
FBU-240F38M-PI	HIPS	Feb 24 2006	Mar 21 2006	38	FAIR

* CERF Certification is valid for one year from the date of the exam.

Sire/Dam	Registration	Birthdate	Sex	Relation	BAER HEARING TEST	CARDIAC	ELBOW	CERF	HIPS	PATELLA	THYROID
KAR-RAES BLESSING IN DISGUISE	NM87378002	May 3 2000	F	Dam		FBU-CA113/14F/C-PI	FBU-EL87F28-PI	FBU-451		FBU-PA253/28F/P-PI	FBU-TH16/28F-PI
MAPLEWOODS BAXTER DQ PIPER	NM91714804	Oct 1 2001	M	Sire	FBU-BR17/57M-PI	FBU-CA173/21M/C-PI		FBU-544	FBU-157G31M-PI	FBU-PA271/31M/P-PI	

Offspring	Registration	Birthdate	Sex	BAER HEARING TEST	CARDIAC	CERF	HIPS	PATELLA
PIPER'S KEEPING THE FAITH	NP12594204	Feb 7 2006	F		FBU-CA401/17F/C-PI	FBU-837	FBU-358F29F-VPI	FBU-PA507/17F/P-PI

[MAPLEWOODS LEGACY FROM PIPER](#) NP12594202 Feb 7 2006 F FBU-BR37/17F-PI FBU-CA439/17F/C-PI FBU-795 MILD UNILATERAL LEFT FBU-PA523/17F/P-PI
CHIC

Full Siblings	Registration	Birthdate	Sex	Relation	BAER HEARING TEST	CARDIAC	ELBOW	CERF	HIPS	THYROID
KAE-RAE VALLEY HIGH LALLIQUE	NP02165401	Dec 11 2002	F	Full	FBU-BR13/43F-PI	FBU-CA200/18F/C-PI	FBU-EL149F41-PI	FBU-591	FBU-251G41F-PI	FBU-TH61/42F-PI

Half Siblings(Dam)	Registration	Birthdate	Sex	Relation	CARDIAC	PATELLA
KAE-RAE DESTINY STARCREEK CALEE	NP05706201	Mar 19 2004	F	Half(Dam)	FBU-CA290/21F/P-PI	FBU-PA379/21F/P-PI

Hip Status Vertical Pedigree

[Printable](#) [Hips](#) [Elbows](#) [Cardiac](#) [Thyroid](#) [Patella](#) [CERF](#)

KAE-RAE ROEMERS MONET OF LAS ALLE NP02165403

[Return to info display](#)

KAE-RAE ROEMERS MONET OF LAS ALLE <u>subject</u> "FAIR"	MAPLEWOODS BAXTER DQ PIPER <u>sire</u> "GOOD"	<u>paternal grandsire</u> (?)
Sibs(1) GOOD(1)		<u>paternal granddam</u> (?)
Offspring(2) FAIR(1) {MILD UNILATERAL LEFT(1)}	KAR-RAES BLESSING IN DISGUISE <u>dam</u> ""	KAE-RAE GREAT GOBLIN GARGOYLE <u>maternal grandsire</u> "GOOD"
		<u>maternal granddam</u> (?)

The OFA database is not directly linked to the AKC or any other registry. Parent, Offspring, and Sibling information is limited to dogs contained in the OFA database, and where the sire/dam information has been filled out on the application so that subsequent relationships can be determined. Titles are included as a courtesy and are limited to those provided on the dog's application.

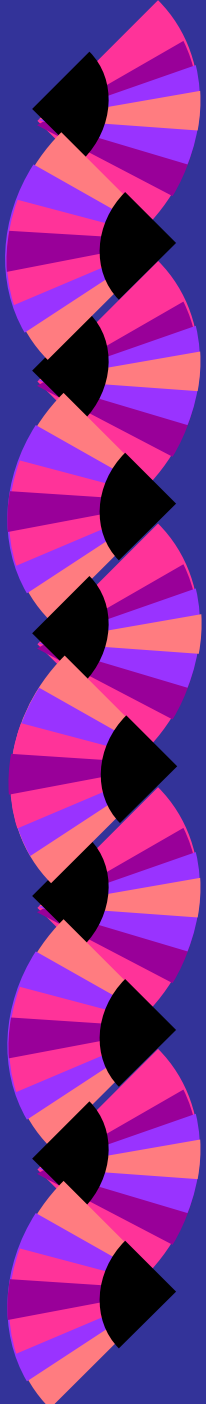
Hip Status Vertical Pedigree

[Printable](#)
[Hips](#)
[Elbows](#)
[Cardiac](#)
[Thyroid](#)
[Patella](#)
[CERF](#)

BRAXFIELD FIRE POWER SN71334501

[Return to info display](#)

<p>BRAXFIELD FIRE POWER <u>subject</u> "FAIR"</p> <p>Sibs(1) EXCELLENT(1)</p> <p>Offspring(0)</p>	<p>TIMBARAY'S DANGEROUS LIAISON <u>sire</u> "GOOD"</p> <p>Sibs(1) GOOD(1)</p>	<p>SCIMITAR'S ULTIMATE DANGER <u>paternal grandsire</u> "EXCELLENT"</p> <p>Sibs(1) GOOD(1)</p>
	<p>HALCYON BRAXFIELD REMINISCE <u>dam</u> "GOOD"</p> <p>Sibs(3) GOOD(3)</p>	<p>TIMBARAY'S SCOTIC MYSTIQUE <u>paternal granddam</u> "GOOD"</p> <p>Sibs(10) GOOD(9) FAIR(1)</p> <p>O'BURKE MACCABEE <u>maternal grandsire</u> "GOOD"</p> <p>Sibs(0)</p> <p><u>maternal granddam</u> (?)</p>



BRAXFIELD FIRE POWER CHIC

Registration: SN71334501 (AKC)

Breed: GORDON SETTER

Sex: M

Color: BLACK & TAN

Birthdate: Feb 4 2000

DNA Profile: V241451

Sire: SN35112001

Dam: SN32438805

***Titles:** CH

CHIC #: 14454

Addtl. Reg. #



OFA Number	Registry	Test/Film Date	Report Date	Age	Final Conclusion
GSE-3787F24M-PI	HIPS	Feb 4 2002	Apr 9 2002	24	FAIR
	ELBOW	Feb 4 2002	May 8 2002	24	UAP/DJD III UNILATERAL RIGHT
GSE-DNA-3/B	DNA DATA BANK	Sep 6 2006	Sep 8 2006	79	DNA Sample Donated for Canine Health Research
GSE-TH11/84M-PI	THYROID	Feb 5 2007	Mar 8 2007	84	NORMAL
GSE-594	CERF	Sep 16 2007	Sep 16 2007	91	TESTED: 01,04,07
GSE-CA19/91M/C-PI	CARDIAC	Sep 16 2007	Sep 24 2007	91	NORMAL - CARDIOLOGIST

Sire/Dam	Registration	Birthdate	Sex	Relation	CARDIAC	DNA DATA BANK	ELBOW	CERF	HIPS	THYROID
HALCYON BRAXFIELD REMINISCE CHIC	SN32438805	Jan 29 1996	F	Dam	GSE-CA18/139F/C-PI	GSE-DNA-1/B	GSE-EL115F24-T	GSE-498	GSE-3195G24F-T	GSE-TH4/24F-T
TIMBARAY'S DANGEROUS LIAISON	SN35112001	May 10 1996	M	Sire		GSE-DNA-172/B		GSE-535	GSE-3280G26M-T	

Full Siblings	Registration	Birthdate	Sex	Relation	DNA DATA BANK	ELBOW	HIPS	THYROID
BRAXFIELD FIRED UP	SN71334504	Feb 4 2000	F	Full	GSE-DNA-128/S	GSE-EL198F28-PI	GSE-3830E28F-PI	GSE-TH15/32F-PI

Half Siblings(Sire)	Registration	Birthdate	Sex	Relation	DNA DATA BANK	ELBOW	CERF	HIPS
CRYSTAL'S MANDOLIN WIND	SN65509201	Jun 11 1999	F	Half(Sire)		GSE-EL196F34-PI		GSE-3816G34F-PI
CRYSTAL'S GO OUT DANCING	SN65509203	Jun 11 1999	F	Half(Sire)		GSE-EL200F37-PI		MODERATE
TIMBARAY DANGEROUS ENCOUNTER	SN71927402	Jan 9 2000	M	Half(Sire)			GSE-585	GSE-3904F36M-PI
WOOD-ROW'S ILLUSION OF DANGER	SN71927401	Jan 9 2000	M	Half(Sire)	GSE-DNA-180/B			
KARRELENES RHYMA AT BREACON	SN75812502	Jun 9 2000	F	Half(Sire)			GSE-626	GSE-3826F24F-PI
KARRELENE'S SECRET AGENT MAN	SN75812501	Jun 9 2000	M	Half(Sire)			GSE-603	GSE-3837G24M-PI
TIMBARAY'S CLEARLY CLASSIC TARA	SN79640509	Nov 28 2000	F	Half(Sire)				MILD UNILATERAL LEFT
BIRCH RUNS CLEARLY INCOMPARABLE	SN79640501	Nov 28 2000	M	Half(Sire)			GSE-667	GSE-3947G29M-PI
BIRCH RUN'S CRYSTAL CLEAR CHIC	SN79640502	Nov 28 2000	F	Half(Sire)	GSE-DNA-101/B	GSE-EL291F56-PI	GSE-628	GSE-4239G56F-PI
TITAN&METHYST'S BAILEY BOY	SN84429102	Jun 16 2001	M	Half(Sire)				GSE-3959G24M-PI

If registered owner appear in the authorization box below which permits the OFA to release abnormal results to the public.

Signature of owner or authorized representative _____

Authorization to Release Abnormal Results

I hereby authorize the OFA to release the results of its radiographic evaluation of the animal described on this application to the public if the results are abnormal _____ (initials of registered owner).

OFA Database

The dysplasia control database of the OFA is a voluntary program established to evaluate radiographs and to identify films showing no radiographic evidence of dysplasia or other orthopedic problems. All films submitted that are of acceptable diagnostic quality will be reviewed by qualified veterinary radiologists and a consensus report will be returned to the owner of record and referring veterinarian. Only animals that are 24 months of age or older to the day at the time of radiography, with no radiographic evidence of dysplasia, will be assigned a breed OFA number. The OFA does offer a consultation service for those under 24 months of age.

Fees

Animals Over 24 Months

- Hip dysplasia database \$30.00
- Elbow dysplasia database \$25.00
- Elbows plus hips (together) \$35.00
- Litter of 3 or more submitted together \$75.00

Kennel Rate—Individuals submitted as a group, owned/co-owned by same person.

- Minimum of 5 individuals \$15.00 per study

Animals Under 24 Months

- Preliminary hip evaluation \$25.00
- Preliminary elbow evaluation \$25.00
- Elbows plus hips (together) \$30.00
- Litter of 3 or more submitted together \$45.00

Veterinary Information

This animal was restrained using:

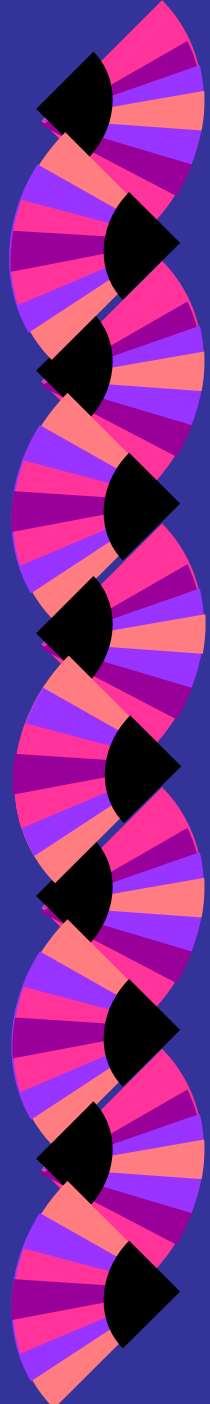
1. Physical Restraint only _____
2. Chemical Restraint
 - Anesthesia _____ type _____
 - Tranquilizer _____ type _____
 - Other _____ type _____

Veterinarian's signature _____

Instructions

Radiographs should be permanently identified in the film emulsion with:

1. Registered name and/or number
 2. Name of veterinarian or hospital making the film
 3. Date of radiograph taken
- Pelvic evaluation are based on the standard VD view with good pelvic definition, pelvis not tilted and femurs extended and parallel
 - Elbow evaluations are based on the standard flexed medial to lateral view



French Bulldog

OFA Open Health Reporting

Year

% Open

2002

31%

2003

13%

2004

16%

2005

20%

2006

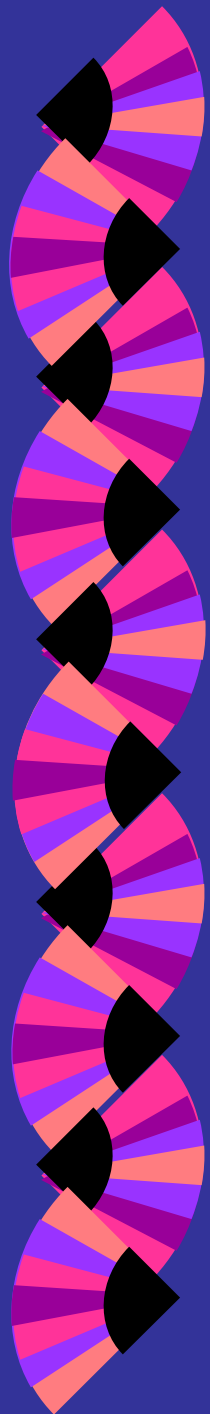
16%

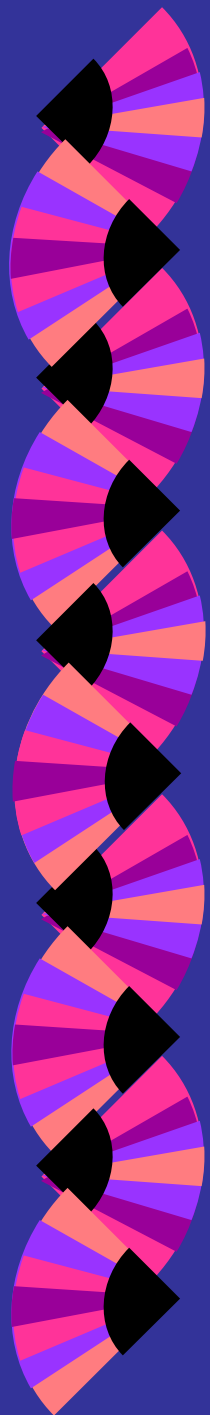
2007

15%

2008

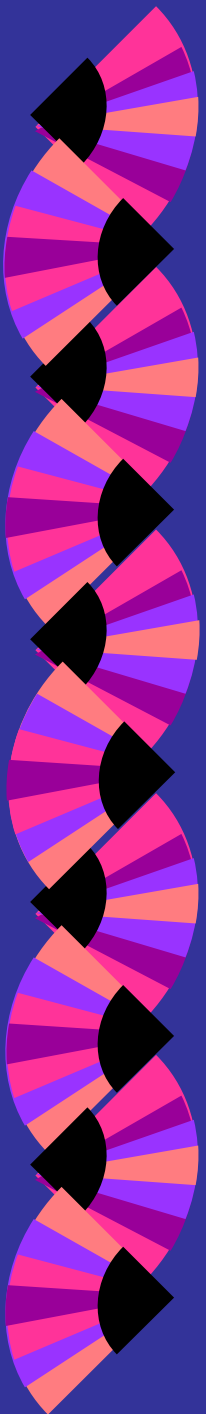
22%





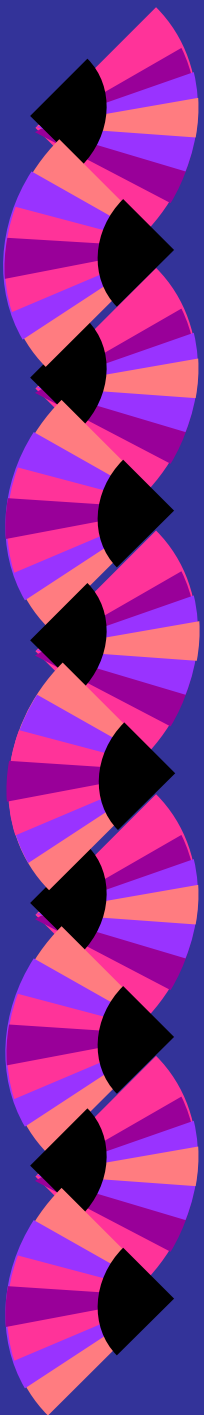
***“As long as we keep problems
‘secret’ we will not be able
to deal with them.”***

Breeders need to be informed about the problems occurring in the offspring they produce



Using Genetic Tests

- ◆ Direct Gene Test
 - ◆ Test of the genotype
 - ◆ Only need to know results of the breeding stock to make breeding decisions
- ◆ Phenotypic Tests, Linkage tests, or No test for carriers
 - ◆ Knowledge of the test results and carrier or affected status of relatives is important

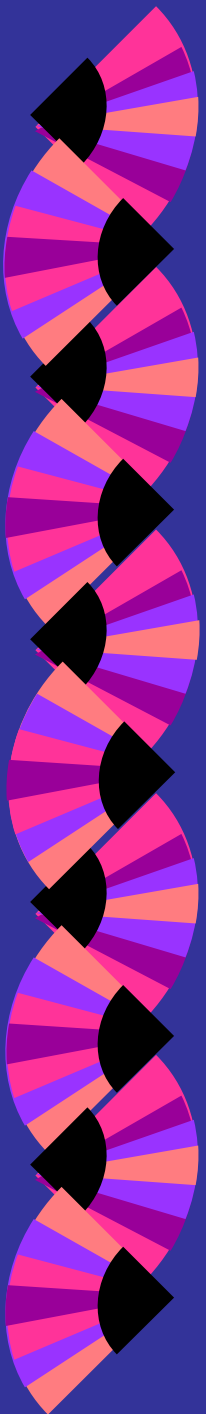




Without tests for carriers

- ◆ Breed higher risk dogs to lower risk dogs
- ◆ Replace the higher risk dog with its
lower risk offspring
- ◆ Repeat the process in the next generation

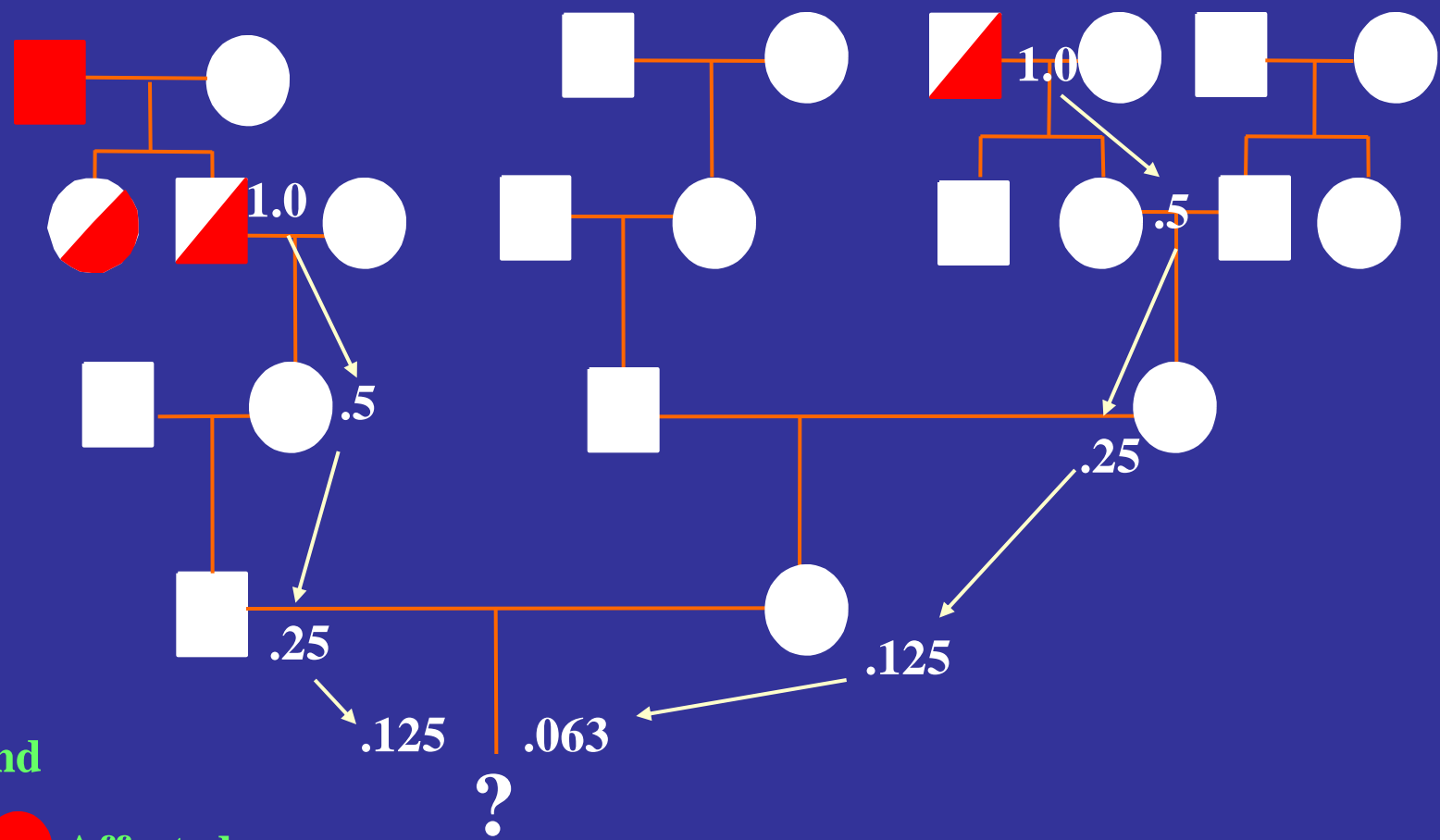
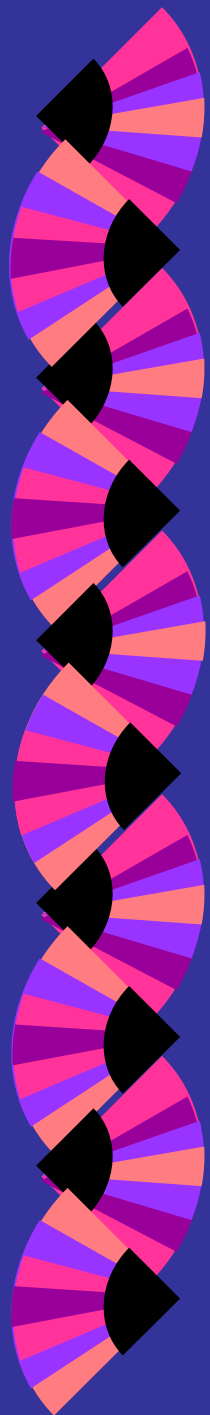
*Relative / Recurrence
Risk Analysis*





Relative Risk Pedigree Analysis

- ◆ Requires a known recessive mode of inheritance
- ◆ Requires an open health registry database
- ◆ Requires openness between breeders and owners on diagnoses



Legend

- Affected**
- Carrier**
- Unknown**

Affected Risk = 0.78%
Carrier Risk = 17.97%

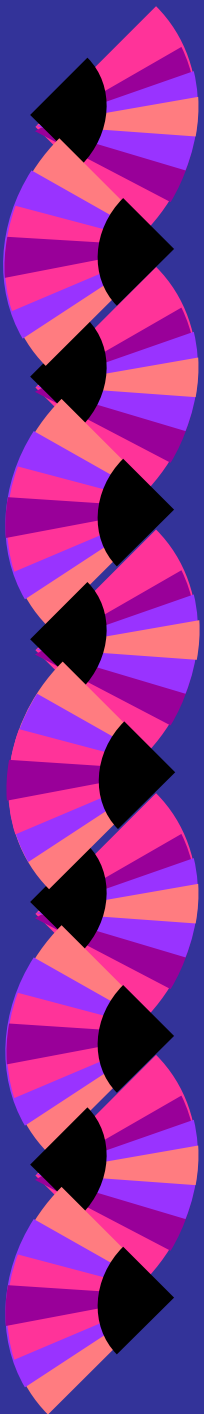
Relative Risk Analysis

◆ Pros:

- ◆ Allows breeders with higher risk breeding stock to lower their risk
- ◆ Allows breeders to understand their own risk, and that of their proposed matings
- ◆ Objectifies risk relative to the population

◆ Cons:

- ◆ Selects against families, based on relatives with risk
- ◆ Selects against carrier and normal individuals



Scottish Terrier Club of America



[\[Who Are We?\]](#) [\[The Standard\]](#) [\[Special Events\]](#) [\[Education\]](#) [\[Health\]](#) [\[Rescue\]](#)

Are you a **newcomer to the breed**? Maybe you think you would like a Scottie, but don't know where to start? Well we have a special introduction to the breed that is designed to help point you in the right direction.

Newcomers, [\[Click here\]](#) to get started with your Scottie adventure.

News and Updates:



© has been added as a new section of the STCW Website.

[\[Click here\]](#) for the Press Release announcing Grand Central, or

Click on the logo to visit the site.

<< [Ways and Means](#) to offer silk Ties and Scarves to Members and Friends

[Letters from Dr. Bell & Dr. Olby](#) -- These are open letters to owners and breeders on CA.

STCA Board announces the [Nominating Committee](#) for 2007

Regional Club News: [The Clan Connection](#) column from the Bagpiper is available on the Web

Health Trust releases [2005 Health Survey Data](#)

The [2006 Specialty Schedule](#). Visit this page to see the latest information on Regional Specialties.

Jerry Roszman, STCA Judges Ed Chair, is available to host [Breed Standard Seminar](#)

[Observations from Birseide](#) - Birseide observations from the 2005 MCFCA Summit are now

Cerebellar Abiotrophy Central

Grand Central
Stops

[Grand Central](#)
[CA Central](#)
[Registry Central](#)
More to come

Sharing what we need to know about Cerebellar Abiotrophy

Today's Date is: Wednesday, 10/4/2006.

This page does include information that will be updated as new information becomes available.
The latest update was on 4/24/06 at 5 PM.

CA Central Topics:

[Cerebellar Abiotrophy](#)
[Autosomal Inheritance](#)
[Relative Risk Analysis](#)
[CA Affected Database](#) *See Below*
[Reference documents](#)

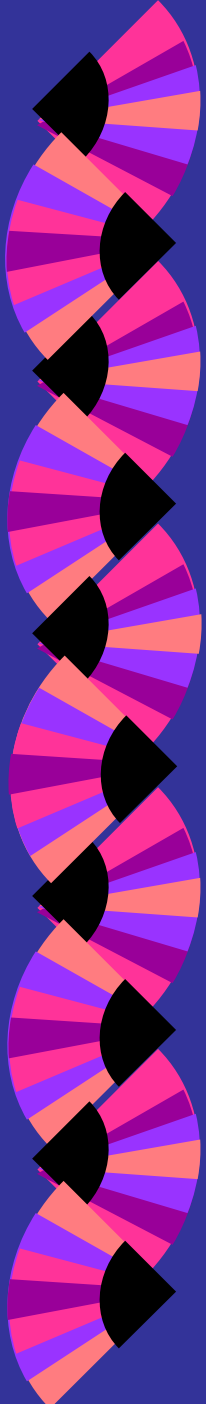
Dear Jerold,

This page contains the listing of Scottish Terriers that have been diagnosed with Cerebellar Abiotrophy and voluntarily released to the STCA by their owners. Access to this page is restricted to visitors who have registered with the site at the Grand Central Registration page. Furthermore, it is expected that all Grand Central visitors will access this page only after they have reviewed all three pages that comprise the introduction to CA Central. These three pages are listed above as the first three items under "CA Central Topics". If for any reason you have not reviewed the information on each of these pages, please do so before proceeding.

Message from Dr. Bell:

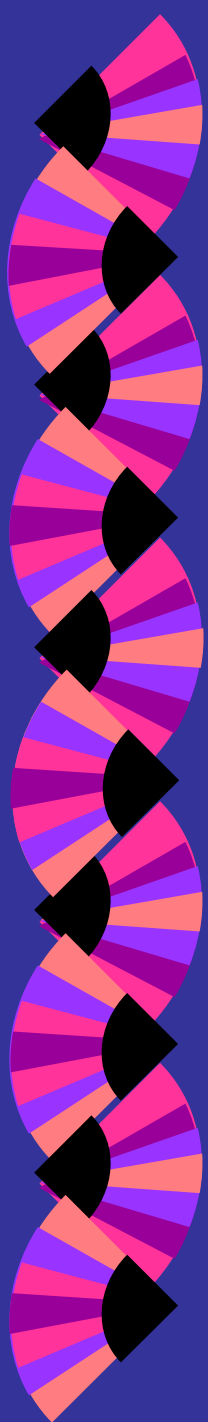
The publication of the STCA cerebellar abiotrophy (CA) open database brings with it great hopes for the future, but also great responsibility. There are two important points to remember:

1. The emotional response to seeing that your Scottish Terrier is related to a CA affected or carrier dog is to not breed it. Quality Scottish Terriers should be bred. This list is intended to assist breeders with making breeding decisions to reduce the risk of producing CA affected dogs and reduce CA carrier risk. Removing quality Scottish Terriers from breeding based only on their relationship to affected or carrier dogs will restrict the genetic diversity of the breed, and lose quality genes that cannot be replaced. Other breeds have gone down this road with devastating effects to their gene pool. Please review "Using Relative Risk Pedigree Analysis and Open Health Registries to Plan Matings" and the article "[*Breeding Strategies for the Management of Genetic Disorders*](#)" in the CA Central [Reference](#) section.
2. Putting pedigrees of CA affected dogs together to attempt to predict ancestral carriers is called witch-hunting. If this is done, you will identify prolific, quality, ancestral stud dogs. These dogs will be identified because their matings to bitches of diverse pedigree backgrounds link the pedigrees together. With an old, widespread autosomal recessive defective gene, it is just as likely that these



CA Affected Database

Date	Name +	Registration	Date of Birth	Sex	Sire	Dam
4-18	McAlpine's Crown Jewel	RB281460	11/14/1988	Female	Ch. Sun-Ray Summer Sun	Ch. Lochlaymen Winds of McAlpine
4-18	"Hamish"	unknown	1998	Male	unknown	unknown
4-6	"Gus" (not registered)	RM196209/01	9/11/1996	Male	Kay-Lee Max A Million	Wandersees Oakie of Lloyds
4-6	"Hamish" (unregistered South African-born)	none	Dec. 1991	Female	unknown	unknown
4-6	Caevnes Autumn Sorcery	RM032972/02	10/31/1991	Female	Ch. Charthill Worthy of Colwick	Caevnes Amy March of Alcott
4-6	Charthill Flower of the Winds	RM326232/01	10/4/2000	Female	Ch. Wild Wind Son of the Sea	Ch. Charthill Victory Garden
4-6	Hulett's Scot Terror	RM177947/03	3/31/1996	Male	York's Scooter Two	Black Lady of the Dawn
4-4	"Angus" (not registered)	RM129890/01	12/19/1994	Male	McDuff of Oakleaf	Fibber's Molly Doll
4-4	"Becca"	unknown	~2001	Female	unknown	unknown
4-4	"Bonnie" (Unregistered)	RM310901/04	5/28/2000	Female	King Pippy	Mat-Su Dixie
4-4	"Casey"	unknown	~1998	Male	unknown	unknown
4-4	"Maggie"	RN021441/??	2/13/2003	Female	Ch. Su-Ets Devilish Charisma	Palo Verde's Kelli Mae
4-4	"Murphy"	unknown	Fall 2001	Male	unknown	unknown
4-4	"Sean Elihu"	unknown	~ 1994	Male	unknown	unknown
4-4	Barbo's Mistletoe and Holly	RM192923/02	12/15/1996	Female	Ch. Selkirk Road to Galashiels	Barbo's Ebony Chatelaine
4-4	Black Watch Jock	RN002752/01	3/31/2002	Male	High Jink's Rufus	Foxfire's Georgie Girl
4-4	Casi's Magic Evermore	RM330726/04	11/27/2000	Female	Ch. Casi's Millennium Magic	Ch. Glenby's Forget Me Not
4-4	Ch. Top Brass Reveille O'Jacglen	RM207924/01	2/1/1997	Female	Ch. Scotsglen Christopher Robin	Ch. Top Brass Jacglens Foxy Lady
4-4	Coleco's Wild Thing	RM117880/02	5/23/1994	Male	Ch. Selkirk Road to Galashiels	Ch. Auchenscot Learig of Scarista
4-4	DanZin Thanks For The Memories	RN041177/01	12/11/2003	Female	Ch. Charthill Bravo	Ch. Charthill Icing On The Cake
4-4	Gaelforce Ace In The Hole	RN036237/04	8/4/2003	Male	Ch. Glenby's Hidden Treasure	Gaelforce Yours To Kiss
4-4	Gracenote of Walking Shadow	RN021910/05	4/3/2003	Female	Ch. Neidfyre Vitta Rouge	Glenheather Midnight Starr
4-4	Gryndscot Braveheart	CKC: NW913313	11/17/2003	Male	Can.Ch. TKO Waking Ned Devine	Can.Ch. Oban ClearN Present Danger
4-4	Gryndscot Milky Way	CKC: NW920303	11/17/2003	Male	Can.Ch. TKO Waking Ned Devine	Can.Ch. Oban ClearN Present Danger
4-4	Gryndscot Scottish Toffee	CKC NW913314	11/17/2003	Male	Can.Ch. TKO Waking Ned Devine	Can.Ch. Oban ClearN Present Danger
4-4	Hawk's Maggie	RM266726/05	12/28/1998	Female	Warfield's Duke of Wheat	Cloie Elizabeth Warfield
4-4	Hollyloch Blue Moon	RM271543/01	3/2/1999	Male	Ch. Hollyloch Dress Blues	Hollyloch Rhubarb Rock



Pedigree of:

Coleco Wild Thing
b. 5/23/1994 Black Reg No.RM117880/02
A

[\[PEDIGREE w/o LINKS\]](#)
[\[BREEDING INFO\]](#)
[\[TRIAL PEDIGREE\]](#)
[\[REVERSE PEDIGREE\]](#)

[AM CH Selkirk Road To Galashiels](#)
b. 8/24/1989 Black Reg No.RB335614

C
[\[PEDIGREE w/o LINKS\]](#)
[\[BREEDING INFO\]](#)
[\[TRIAL PEDIGREE\]](#)
[\[REVERSE PEDIGREE\]](#)

[AM CH Auchenscot Learig of Scarista](#)

b. 6/20/1988 Black Reg No.RB259500
C

[\[PEDIGREE w/o LINKS\]](#)
[\[BREEDING INFO\]](#)
[\[TRIAL PEDIGREE\]](#)
[\[REVERSE PEDIGREE\]](#)

[UK/AM/CAN CH Killisport Rox at Scarista ROMS](#)

b. 9/24/1984 Brindle Reg No.RB093803

[AM CH Selkirk Heather of Scarista](#)
b. 4/22/1987 Brindle Reg No.RB151000

[Wiljoy Hue and Cry of Scarista](#)
b. Reg No.

[Auchenscot Amo Amas](#)
b. Reg No.

[UK/AM/CAN CH Scarista's Rocky](#)

[Jenny Wren of Killisport](#)

[Scarista Red Hackle](#)

[Killisport Country Maid](#)

[UK CH Town Crier of Mayson](#)

[UK CH Wiljoy Solitaire](#)

[UK/AM/CAN CH Killisport Rox at Scarista ROMS](#)

[Backmuir Blackberry](#)

[INT/GER CH Scarista Lord Snooty](#)

[Millig Miss Marquesa](#)

[UK CH Mayson Monopoly](#)

[Swarthland Bramble](#)

[Viewpark Alexander](#)

[Millig Miss Marquesa](#)

[UK CH Town Crier of Mayson](#)

[Killisport Conspiracy](#)

[UK CH Tamzin Townsman](#)

[Mayson Masquerade](#)

[UK CH Mayson Monopoly](#)

[Treasure Trove of Noonsun](#)

[UK/AM/CAN CH Scarista's Rocky](#)

[Jenny Wren of Killisport](#)

[UK/AM/CAN CH Scarista's Rocky](#)

[Victoria of Backmuir](#)

Pedigree generated by *WebGene!* 4.7.0 (2004.05.01) using database *Peds-9-1-06.dbw* on Sat 07 Oct 02:21:20 2006 UTC.

There are no guarantees made as to the accuracy of the data published at this site. For questions or further information, please visit Sponsor *Scottish Terrier Club of America* on the Internet at <http://clubs.aks.org/stca/>.



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Database maintained by jto@mitre.org. Please contact them for questions, additions, or changes regarding the database.

To avoid this stamp, please register your trial copy

Offspring

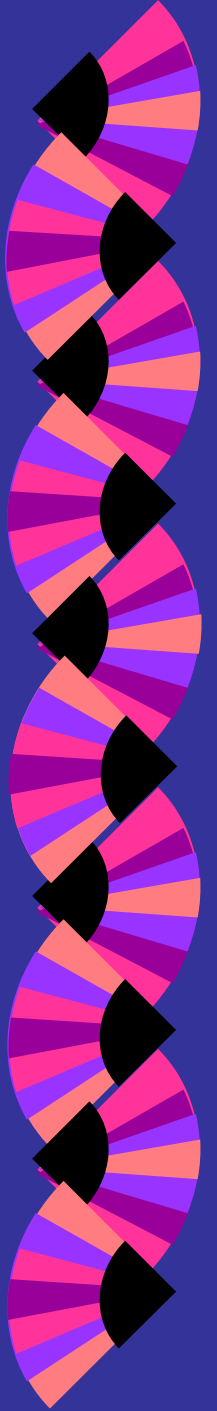
See bottom of the page for instructions and calculated results.

		GreatGrandSire	GreatGreatGrandSire	GreatGreatGreatGrandSire
				GreatGreatGreatGrandDam
			GreatGreatGrandDam	GreatGreatGreatGrandSire
				GreatGreatGreatGrandDam
		GreatGrandDam	SC	GreatGreatGreatGrandSire
				GreatGreatGreatGrandDam
		GreatGreatGrandDam		GreatGreatGreatGrandSire
				GreatGreatGreatGrandDam
	GrandDam	GreatGrandSire	GreatGreatGrandSire	GreatGreatGreatGrandSire
				GreatGreatGreatGrandDam
			GreatGreatGrandDam	GreatGreatGreatGrandSire
				GreatGreatGreatGrandDam
		GreatGrandDam	GreatGreatGrandSire	GreatGreatGreatGrandSire
				GreatGreatGreatGrandDam
		GreatGreatGrandDam		GreatGreatGreatGrandSire
				GreatGreatGreatGrandDam
Dam	GrandSire	GreatGrandSire	GreatGreatGrandSire	GreatGreatGreatGrandSire
				GreatGreatGreatGrandDam
			GreatGreatGrandDam	GreatGreatGreatGrandSire
				GreatGreatGreatGrandDam
		GreatGrandDam	GreatGreatGrandSire	GreatGreatGreatGrandSire
				GreatGreatGreatGrandDam
		GreatGreatGrandDam		GreatGreatGreatGrandSire
				GreatGreatGreatGrandDam
	GrandDam	GreatGrandSire	GreatGreatGrandSire	GreatGreatGreatGrandSire
				GreatGreatGreatGrandDam
			GreatGreatGrandDam	GreatGreatGreatGrandSire
				GreatGreatGreatGrandDam
		GreatGrandDam	GreatGreatGrandSire	GreatGreatGreatGrandSire
				GreatGreatGreatGrandDam
		GreatGreatGrandDam		SC
				GreatGreatGreatGrandDam

Affected Risk = 0.05%
Carrier Risk = 4.64%

Instructions: Change text to "A" for Affected, "C" for Obligate Carrier, "SA" for Full Sibling of Affected; or "SC" for Full Sibling of Obligate Carrier.
Error

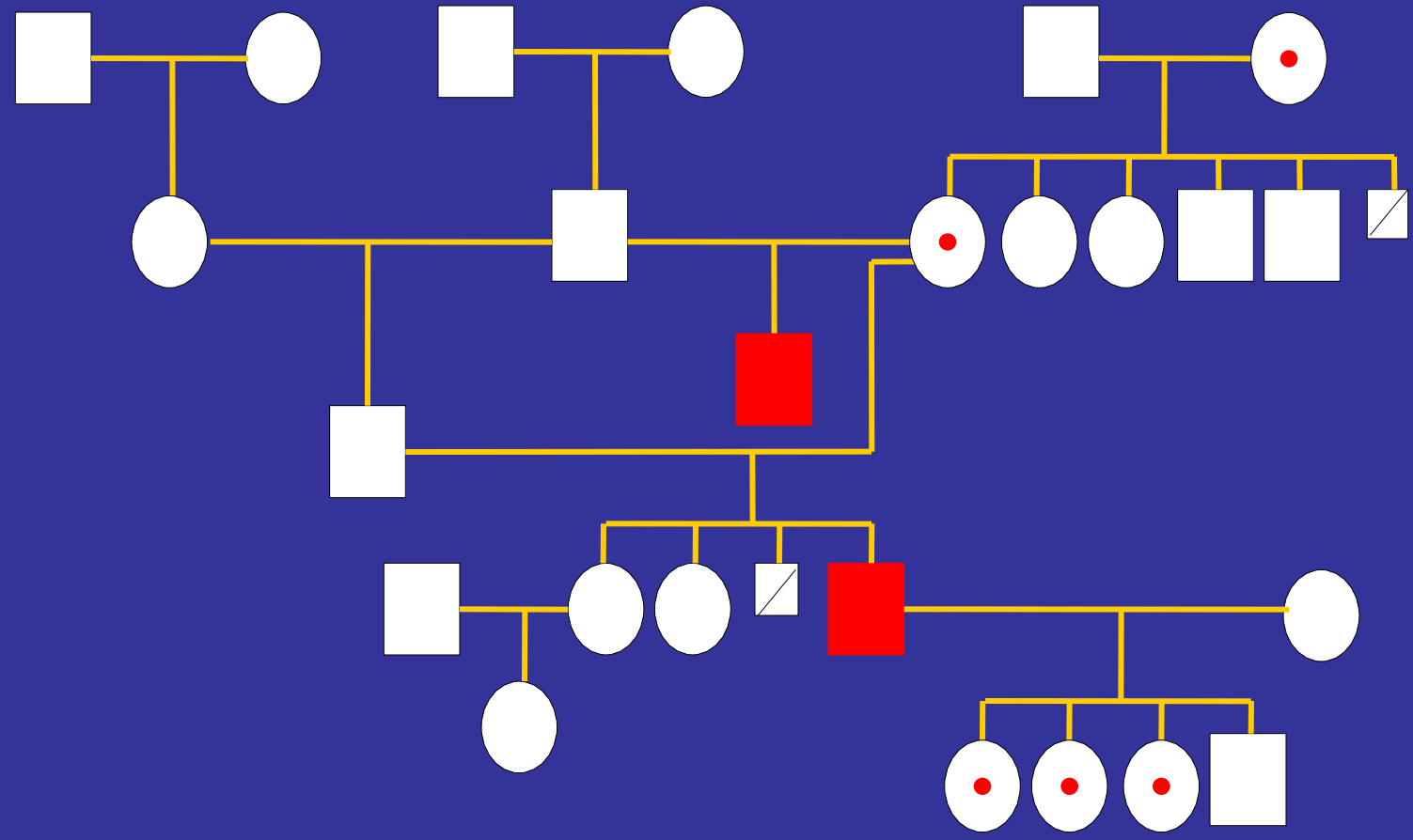
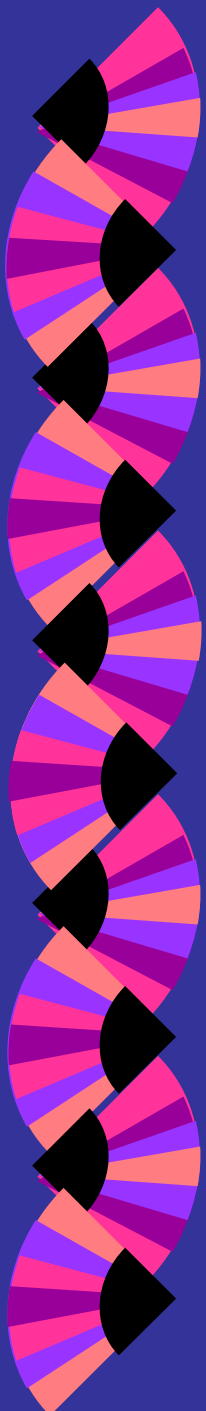
Messages: For "ERR001" message errors, you should delete the code because it has reduced the risk factor from previous generations.





Managing Sex-linked Genes

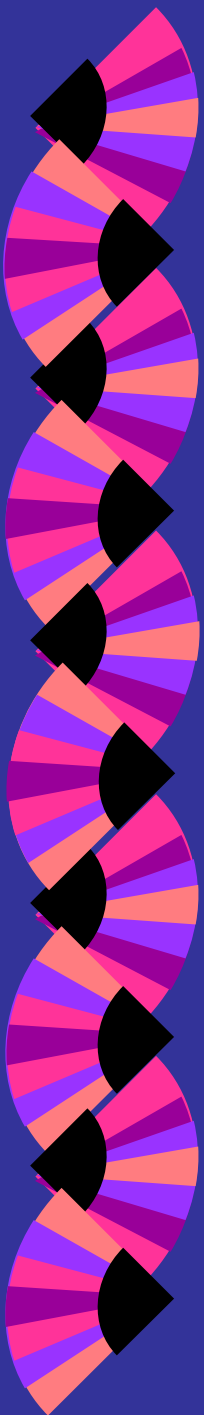
- ◆ Ex) hemophilia A & B, muscular dystrophy, Siberian Husky/Samoyed PRA.
- ◆ Follow the same “breed and replace” recommendations, for autosomal recessive genes, except:
 - ◆ Using normal males will always lose the defective gene
 - ◆ Affected males have carrier mothers, and all carrier daughters
 - ◆ Carrier mothers have 50% affected sons
 - ◆ Replace carrier females with normal male sibs or male offspring

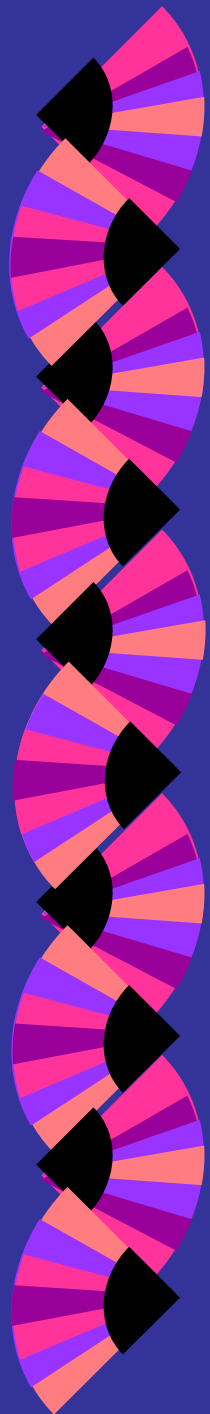


■ Male ● Female ■ ● Normal ■ ● Affected
●● Obligate Carrier Female ▨ Neonatal death

Managing Polygenic Disorders

- ◆ Ex) congenital heart anomalies, hip dysplasia, patella luxation
- ◆ Identify phenotypic traits tied to the underlying genes
- ◆ Phenotypic breadth of pedigree provides information on the possible range of genes carried
- ◆ Treat disorders as threshold traits
- ◆ Breed normal dogs from (mostly) normal litters

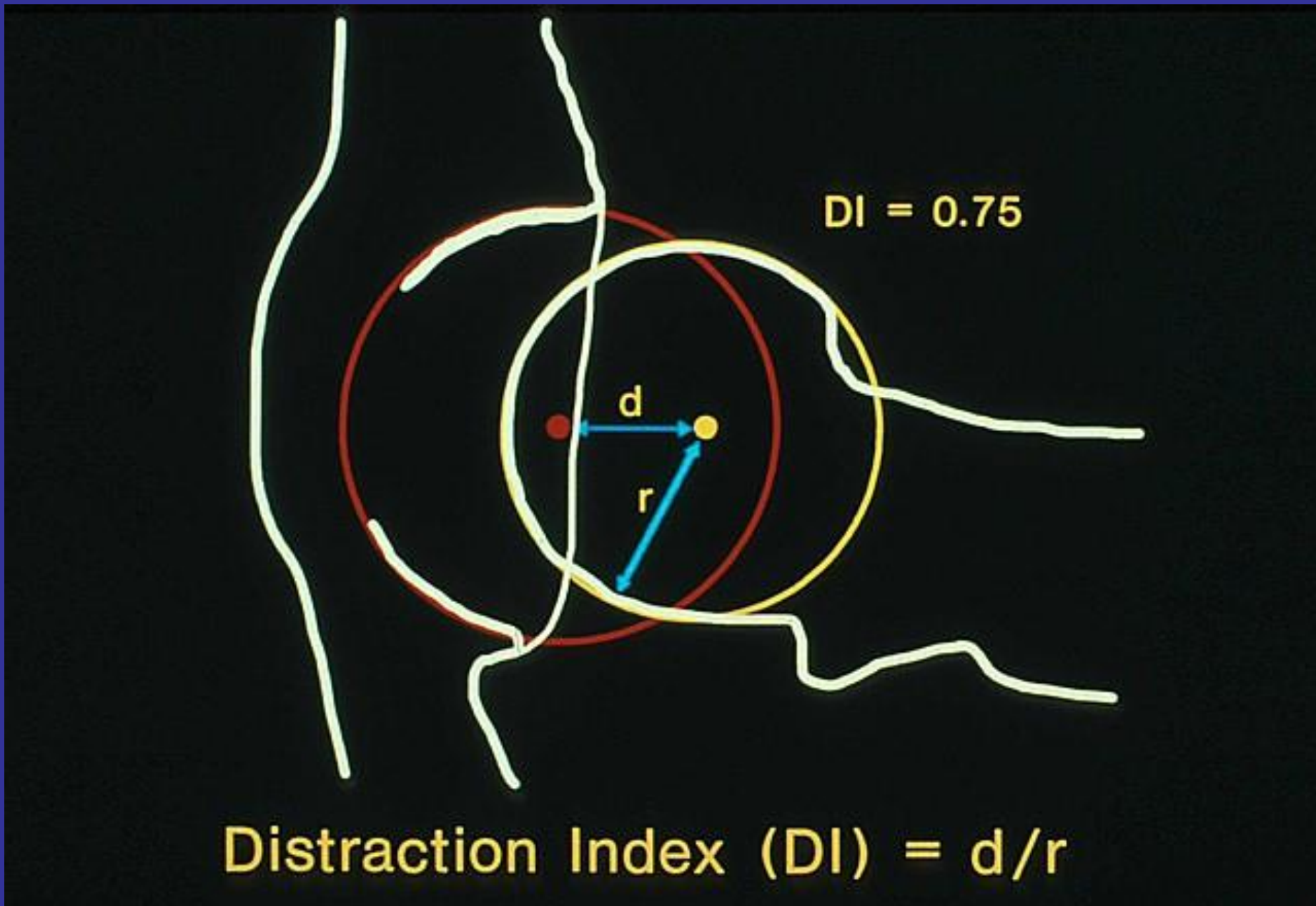
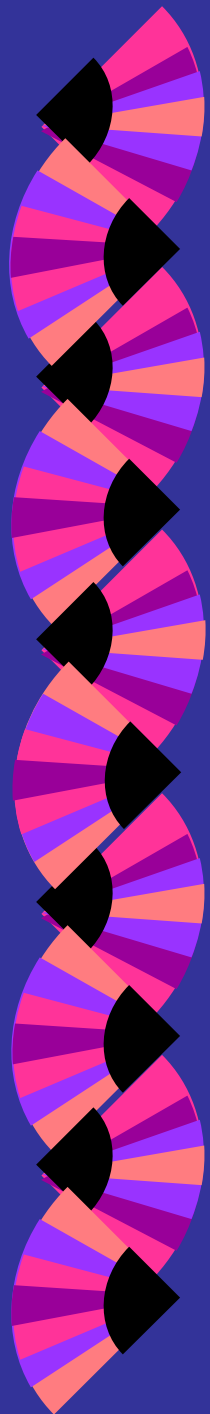


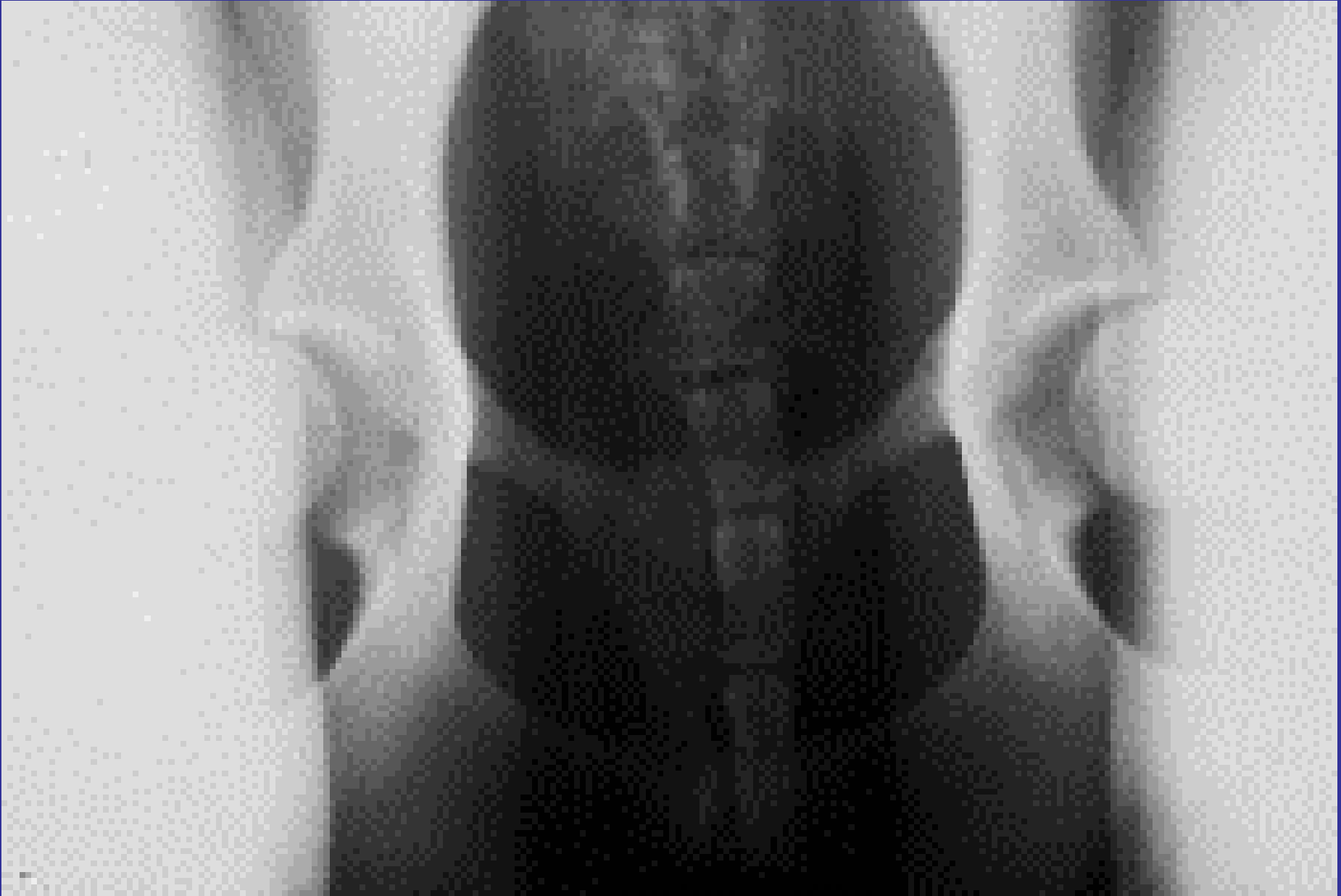
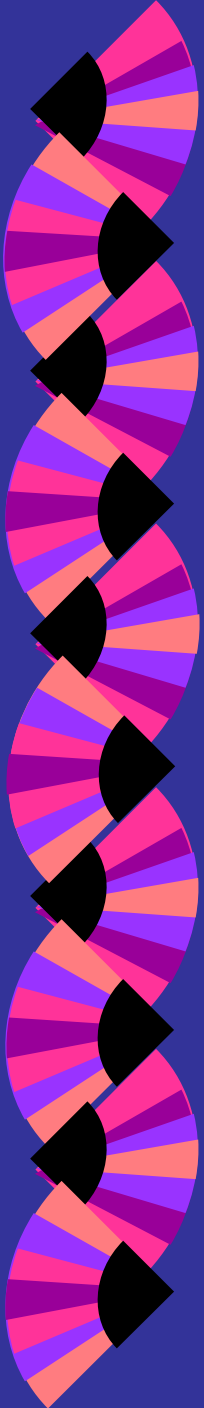




University of Pennsylvania Hip
Improvement Program

Early Evaluation for Canine Hip Dysplasia



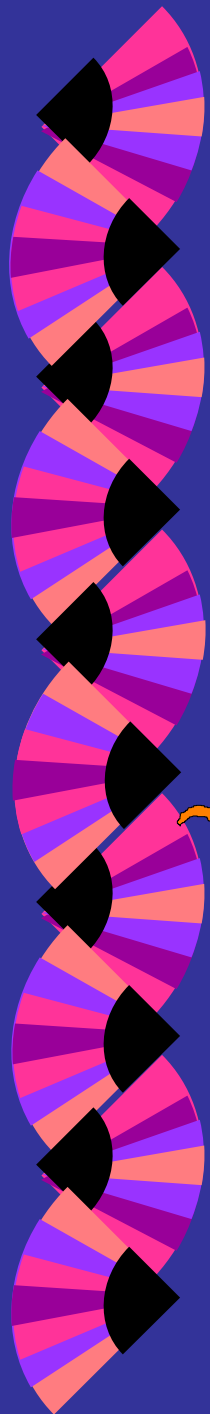
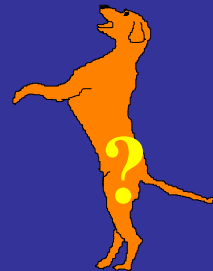
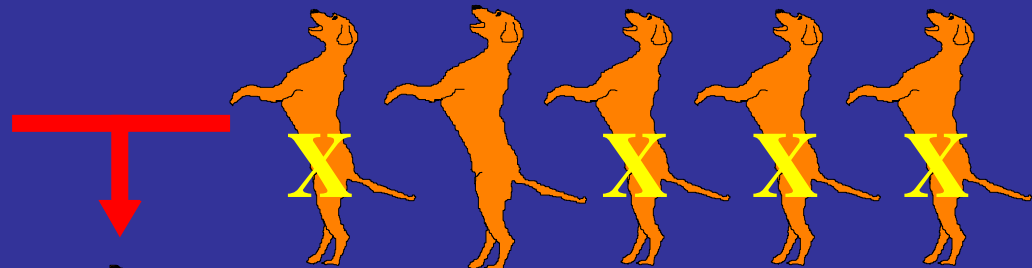
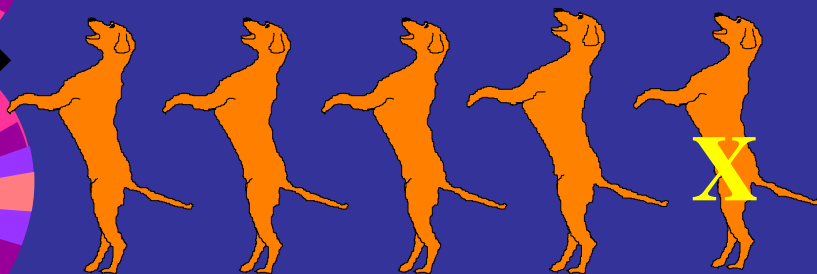
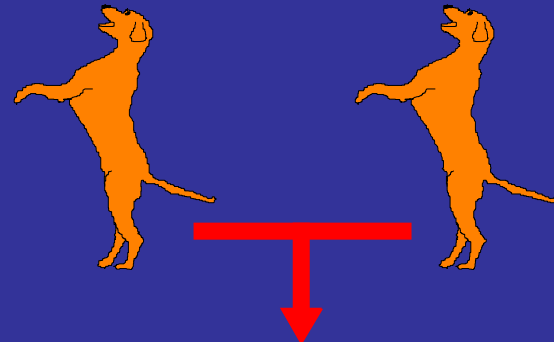
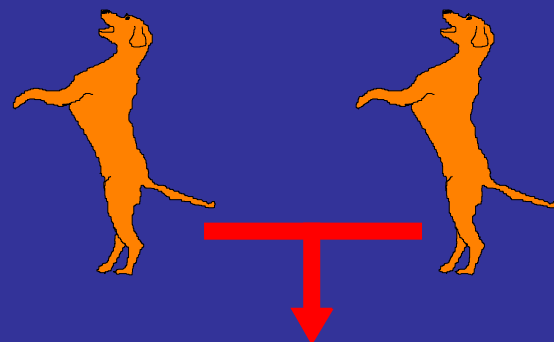




Canine Hip Dysplasia Diagnosis

- Clinical signs
- Palpation with or without anesthesia
- Radiographic anatomy
- Radiographic distraction / laxity

Depth of Pedigree

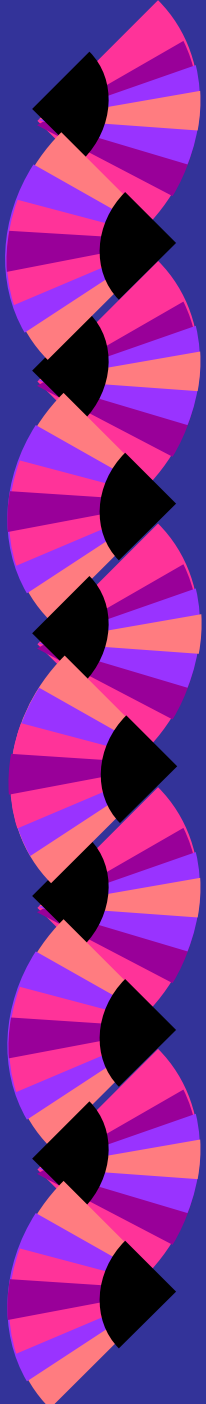
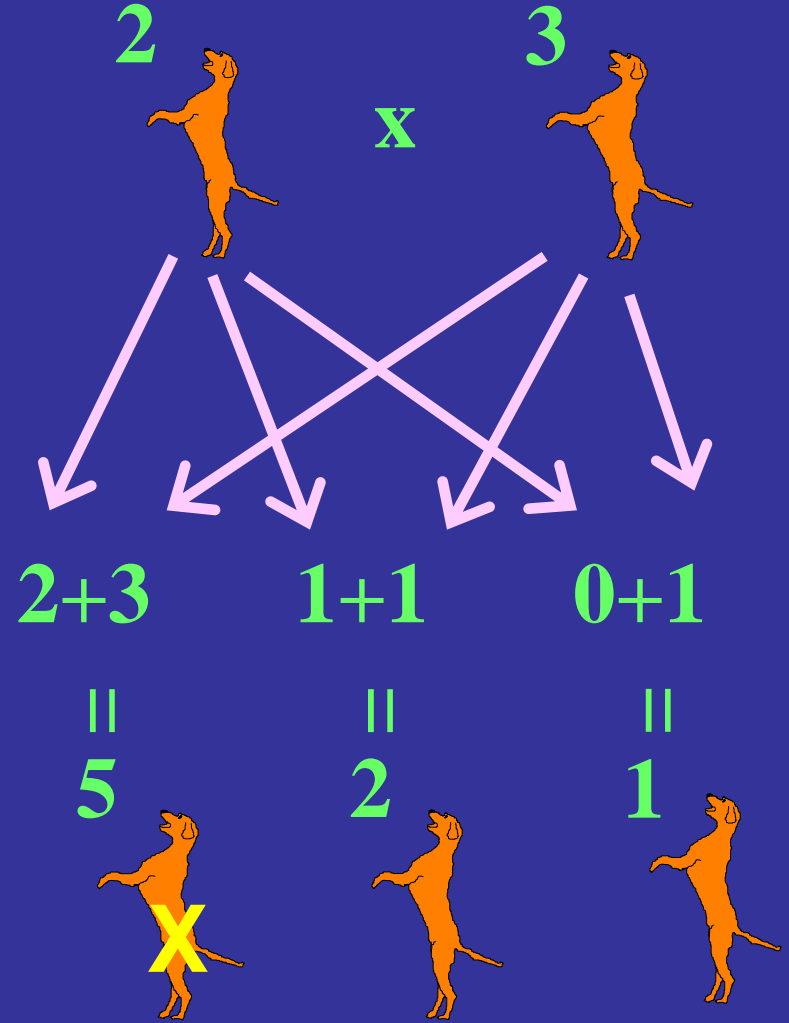
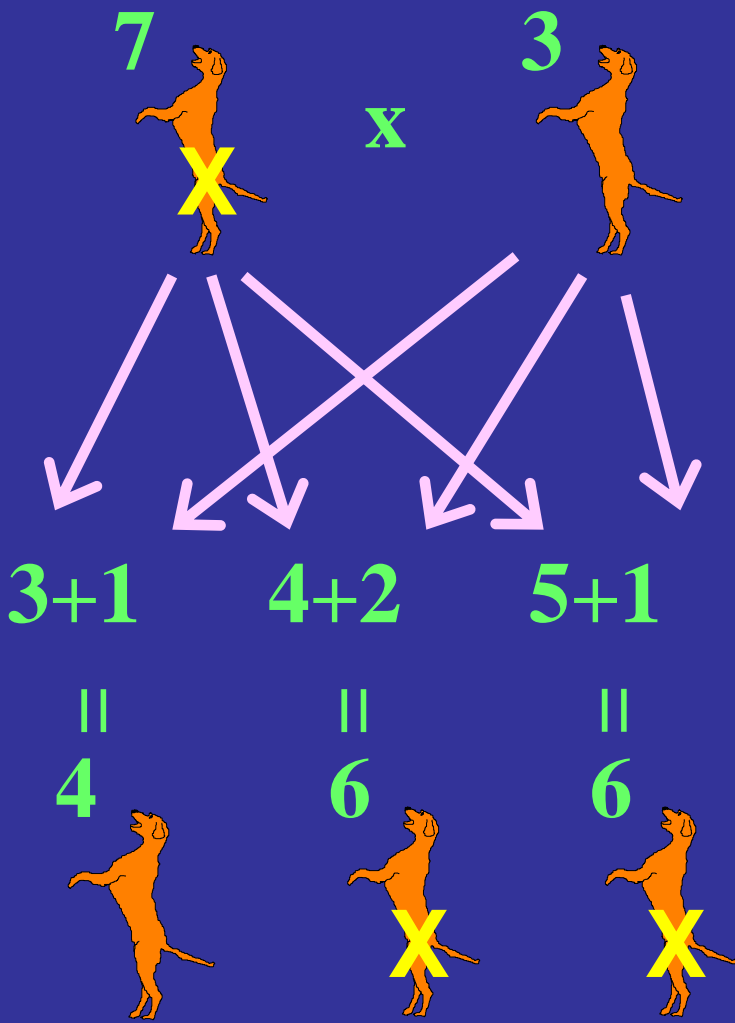




Polygenic disorders are Threshold Traits

A number of genes must combine
to cross a threshold to produce
an affected animal.

Threshold Traits





If there are no tests for carriers:

- ◆ Institute a “vertical mating” system:
 - ◆ Replace known carrier or high risk breeding dogs with quality offspring (through planned breedings to lower risk mates)
 - ◆ Breed the quality offspring and replace them with quality offspring
- ◆ Store semen on dogs, and DNA for future analysis
- ◆ Reintroduce these dogs in the future when a test is available, even if they test to be carriers



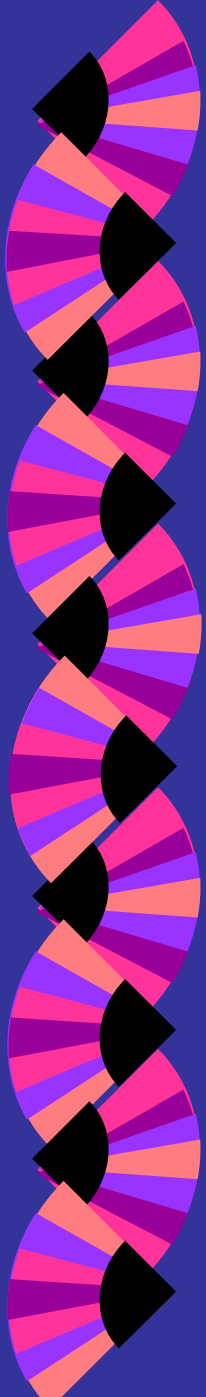
Vertical Mating System:

- ◆ Retains the good genes of your line
- ◆ Reduces the carrier risk with each generation
- ◆ Replaces, does not add to the overall carrier risk in the population



Breeders should use genetic tests to :

- ◆ Identify carriers
- ◆ Work to breed away from the defective gene(s)
- ◆ Prevent the reintroduction of the gene(s) in future breedings



Each breeder must assess
their own breeding stock and
determine their own rate of
progress

- ◆ Replace carriers with normal-testing offspring
- ◆ Decrease carrier frequency or carrier risk with each generation



A Healthy Breeding Program

- ◆ Does not continually multiply carriers
- ◆ Does not limit the genetic diversity of the population
- ◆ Is geared toward producing quality, genetically normal dogs



How Can We Educate the Public?

- ◆ Make them more informed consumers of dogs and puppies
- ◆ Able to discern responsible breeders
- ◆ Knowledgeable about genetic testing
- ◆ Recognize that price and quality should be linked