Canine Primary Ocular Neoplasia
Scott R. Earnest
COPLOW archive includes slides, paraffin-embedded tissue, case submission information, and pathology reports.

Computer database allows us to search entire collection (29000 cases) by diagnosis, breed, age, sex, or case number. Recent improvements in our digital record keeping make it ever more possible to launch broad retrospective studies.

**This Study:** 6110 cases of canine primary ocular neoplasia submitted to COPLOW from 1994-2009.

**Present statistical breakdown according to:**
1. Anatomic location
2. Type of tumor
3. Raw number of tumors by breed
4. Breed predilection for specific tumors (using an odds ratio calculation to correct for overrepresentation of common breeds).
Anatomic Distribution of Canine Primary Ocular Neoplasia (n = 6110)

- Globe, 3225, 53%
- Conjunctiva, 1192, 19%
- Eyelid, 1408, 23%
- Orbit, 285, 5%
Breed Distribution in Study Population

<table>
<thead>
<tr>
<th>Breed</th>
<th>Number of Dogs</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;Other&quot;</td>
<td>2123</td>
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<tr>
<td>Doberman Pinscher</td>
<td>75</td>
</tr>
<tr>
<td>Shetland Sheep Dog</td>
<td>77</td>
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<tr>
<td>Siberian Husky</td>
<td>84</td>
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<tr>
<td>Miniature Schnauzer</td>
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<tr>
<td>Basset Hound</td>
<td>103</td>
</tr>
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<td>Shih Tzu</td>
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<tr>
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<td>Beagle</td>
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<td>Boxer</td>
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<td>Standard Poodle</td>
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<tr>
<td>German Shepherd</td>
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<td>Golden Retriever</td>
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<td>Labrador Retriever</td>
<td>919</td>
</tr>
<tr>
<td>Mixed Breed</td>
<td>1343</td>
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</tbody>
</table>
Canine Primary Tumors of the Globe (n = 3225)

Tumors of the globe make up 3225 out of 6110 total neoplasms - 53%.

- Melanoma: 2216
- Iridociliary Epithelial Tumor: 836
- Spindle Cell Tumor of Blue-Eyed Dogs: 64
- Corneal SCC: 40
- Glioma: 32
- Primitive Neuroectodermal Tumor: 27
- Other: 10

Globe, 3225, 53%
Not Globe, 2885, 47%
K9 Globe Melanoma & Melanocytoma (n=2216)

- "Other" 588
- Lhasa Apso 20
- Schnauzer 22
- Basset Hound 27
- Dachshund 29
- Shetland Sheep Dog 32
- Airedale 32
- Standard Poodle 33
- Doberman Pinscher 35
- Rottweiler 36
- Boxer 45
- Cocker Spaniel 49
- Miniature Schnauzer 51
- Beagle 56
- German Shepherd 85
- Golden Retriever 228
- Labrador Retriever 355
- Mixed Breed 493

Number of Cases
After using an odds ratio calculation to correct for the overrepresentation of popular breeds in our study, our data implicates the Airedale in Melanocytoma.

**Airedale:** 6x the general population frequency for Melanocytoma

Our data also reveals a significant lack of Siberian Huskies with melanocytic tumors of the globe.

**Siberian Husky:** 12x less frequent than the general population
<table>
<thead>
<tr>
<th>Breed</th>
<th>Number of Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;Other&quot;</td>
<td>265</td>
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<td>Jack Russell Terrier</td>
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<td>Shih Tzu</td>
<td>12</td>
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<td>Basset Hound</td>
<td>12</td>
</tr>
<tr>
<td>Cocker Spaniel</td>
<td>21</td>
</tr>
<tr>
<td>German Shepherd</td>
<td>21</td>
</tr>
<tr>
<td>Beagle</td>
<td>25</td>
</tr>
<tr>
<td>Golden Retriever</td>
<td>132</td>
</tr>
<tr>
<td>Labrador Retriever</td>
<td>165</td>
</tr>
<tr>
<td>Mixed Breed</td>
<td>173</td>
</tr>
</tbody>
</table>
Spindle Cell Tumor of Blue Eyed Dogs (n=64)

- Siberian Husky: 30 cases
- Mixed Breed: 16 cases
- Australian Shepherd: 7 cases
- Catahoula Leopard Dog: 4 cases
- "Other": 7 cases

Number of Cases
After using an odds ratio calculation to correct for the overrepresentation of popular breeds in our study, our data implicates Siberian Huskies and Australian Shepherds in the Spindle Cell Tumor of Blue Eyed Dogs.

**Siberian Husky:** 98x the general population frequency

**Australian Shepherd:** 12x the general population frequency
Corneal Squamous Cell Carcinoma (n=40)

- "Other" 8 cases
- Mixed Breed 2 cases
- Pekingese 2 cases
- Golden Retriever 2 cases
- English Bulldog 2 cases
- Border Collie 2 cases
- Shih Tzu 4 cases
- Bulldog 4 cases
- Pug 14 cases

Number of Cases
After using an odds ratio calculation to correct for the overrepresentation of popular breeds in our study, our data implicates the Pug in Corneal Squamous Cell Carcinoma.

**Pug: 61x the general population frequency**
Primitive Neuroectodermal Tumor (n=27)

- Mixed Breed: 8 cases
- Beagle: 3 cases
- Cocker Spaniel: 2 cases
- Labrador Retriever: 2 cases
- Other: 12 cases
Primitive Neuroectodermal Tumor Age Distribution

Number of Cases

Age

Less than 2
2 to less than 4
4 to less than 6
6 to less than 8
8 to less than 10
10 to less than 12
greater than 12
Canine Primary Conjunctival Tumors (n = 1192)

Tumors of the conjunctiva make up 1192 out of 6110 total neoplasms - 20%.

- Peripheral Nerve Sheath Tumor: 11 cases
- Viral Papilloma: 39 cases
- Mast Cell Tumor: 52 cases
- Squamous Cell Carcinoma: 85 cases
- Squamous Papilloma: 110 cases
- Tumor of the Third Eyelid Gland: 152 cases
- Hemangiosarcoma: 156 cases
- Hemangioma: 163 cases
- Melanoma: 204 cases
- Reactive Papilloma: 220 cases

Conjunctiva, 1192, 20%
Not Conjunctiva, 4918, 80%
Conjunctival Reactive Papilloma (n=220)

- "Other": 83 cases
- Pug: 6 cases
- Shih Tzu: 7 cases
- Lhasa Apso: 8 cases
- Cocker Spaniel: 20 cases
- Golden Retriever: 28 cases
- Labrador Retriever: 29 cases
- Mixed Breed: 39 cases

Lhasa Apso: 4x the general population frequency
Conjunctival Melanoma (n=204)

- Mixed Breed: 42 cases
- Golden Retriever: 24 cases
- Labrador Retriever: 24 cases
- Cocker Spaniel: 15 cases
- German Shepherd: 8 cases
- Rottweiler: 8 cases
- Shar-Pei: 7 cases
- "Other": 76 cases
After using an odds ratio calculation to correct for the overrepresentation of popular breeds in our study, our data implicates the German Shepherd in Limbal Melanocytoma.

**German Shepherd: 4x the general population frequency**
Conjunctival Hemangiosarcoma (n=156)

- "Other": 73
- Great Pyrenees: 4
- Golden Retriever: 4
- German Shepherd: 4
- Australian Cattle Dog: 4
- English Setter: 6
- Mixed Breed: 8
- Labrador Retriever: 8
- Boxer: 9
- Basset Hound: 10
- Border Collie: 11
- Beagle: 11
- Australian Shepherd: 12

Number of Cases
After using an odds ratio calculation to correct for the overrepresentation of popular breeds in our study, our data implicates the Border Collie, Australian Shepherd, English Setter, Basset Hound, Beagle, and Boxer in Conjunctival Hemangiosarcoma.

Border Collie: 10x the general population frequency
Australian Shepherd: 9x the general population frequency
English Setter: 8x the general population frequency
Basset Hound: 4.5x the general population frequency
Beagle: 3.5x the general population frequency
Boxer: 3x the general population frequency
Tumor of the Third Eyelid Gland (n=152)

- Mixed Breed: 41 cases
- Labrador Retriever: 13 cases
- Cocker Spaniel: 11 cases
- Golden Retriever: 10 cases
- Siberian Husky: 7 cases
- Dachshund: 5 cases
- Beagle: 5 cases
- Boxer: 4 cases
- Poodle: 4 cases
- "Other": 52 cases
Conjunctival Squamous Papilloma (n=110)

- "Other" 44
- Kerry Blue Terrier 3
- English Springer Spaniel 3
- Boston Terrier 3
- Beagle 3
- Lhasa Apso 4
- Shih Tzu 7
- Golden Retriever 11
- Labrador Retriever 15
- Mixed Breed 17

Number of Cases
Conjunctival Squamous Cell Carcinoma (n=85)

- "Other": 44 cases
- Shih Tzu: 4 cases
- Labrador Retriever: 4 cases
- Cocker Spaniel: 5 cases
- Boxer: 5 cases
- Pug: 7 cases
- Golden Retriever: 7 cases
- Mixed Breed: 9 cases
Conjunctival Mast Cell Tumor (n=52)

- "Other": 17 cases
- German Shepherd: 2 cases
- Basset Hound: 3 cases
- Golden Retriever: 4 cases
- Mixed Breed: 12 cases
- Labrador Retriever: 14 cases

Number of Cases
Conjunctival Viral Papilloma (n=39)

- "Other": 15 cases
- Rhodesian Ridgeback: 2 cases
- Pug: 2 cases
- Norwegian Elkhound: 2 cases
- French Bulldog: 2 cases
- Labrador Retriever: 4 cases
- Golden Retriever: 4 cases
- Mixed Breed: 8 cases

Number of Cases
Viral Papilloma Age Distribution

<table>
<thead>
<tr>
<th>Age</th>
<th>Number of Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 2</td>
<td>12</td>
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<tr>
<td>2 to less than 4</td>
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<tr>
<td>4 to less than 6</td>
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<tr>
<td>6 to less than 8</td>
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<td>10 to less than 12</td>
<td>3</td>
</tr>
<tr>
<td>Greater than 12</td>
<td></td>
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</table>
Canine Primary Eyelid Tumors (n = 1408)

- Meibomian Gland Epithelioma: 482
- Meibomian Gland Adenoma: 505
- Melanoma: 149
- Sebaceous Gland Tumor: 107
- Mast Cell Tumor: 63
- Histiocytoma: 40
- Spindle Cell Tumor: 22
- Plasmacytoma: 15
- Other: 25

Tumors of the eyelid make up 1408 out of 6110 total neoplasms - 23%.
# Meibomian Gland Adenoma (n=505)

<table>
<thead>
<tr>
<th>Breed</th>
<th>Number of Cases</th>
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<tbody>
<tr>
<td>&quot;Other&quot;</td>
<td>184</td>
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<tr>
<td>German Shepherd</td>
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<td>Rottweiler</td>
<td>11</td>
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<td>Shih Tzu</td>
<td>11</td>
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<tr>
<td>Siberian Husky</td>
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<td>Standard Poodle</td>
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<tr>
<td>Pug</td>
<td>16</td>
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<td>Cocker Spaniel</td>
<td>28</td>
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<td>Golden Retriever</td>
<td>52</td>
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<tr>
<td>Labrador Retriever</td>
<td>67</td>
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<tr>
<td>Mixed Breed</td>
<td>101</td>
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</tbody>
</table>
Meibomian Gland Epithelioma (n=482)

- Labrador Retriever: 96 cases
- Mixed Breed: 95 cases
- Cocker Spaniel: 31 cases
- Shih Tzu: 26 cases
- Standard Poodle: 26 cases
- Golden Retriever: 23 cases
- West Highland White Terrier: 12 cases
- "Other": 173 cases
After using an odds ratio calculation to correct for the overrepresentation of popular breeds in our study, our data implicates the Shih Tzu, the Standard Poodle and the Cocker Spaniel in Meibomian Gland Tumors.

**Shih Tzu:** $3x$ the general population frequency

**Standard Poodle:** $2.15x$ the general population frequency

**Cocker Spaniel:** $1.75x$ the general population frequency
Eyelid Melanoma (n=149)

- "Other": 60
- Rottweiler: 4
- Chesapeake Bay Retriever: 4
- Brittany Spaniel: 4
- Beagle: 5
- Doberman Pinscher: 6
- Vizsla: 10
- Labrador Retriever: 11
- Golden Retriever: 15
- Mixed Breed: 30

Number of Cases
After using an odds ratio calculation to correct for the overrepresentation of popular breeds in our study, our data implicates the Viszla and the Doberman Pinscher in Eyelid Melanoma.

**Viszla:** 18x the general population frequency

**Doberman Pinscher:** 3.5x the general population frequency
Eyelid Sebaceous Gland Tumor (n=107)

"Other" 31
Shih Tzu 2
Shetland Sheep Dog 2
Pug 2
Miniature Poodle 2
German Shepherd 2
English Springer Spaniel 2
West Highland White Terrier 3
Cocker Spaniel 9
Golden Retriever 12
Mixed Breed 18
Labrador Retriever 22

Number of Cases
Eyelid Mast Cell Tumor (n=63)

- "Other": 12 cases
- Pug: 2 cases
- Miniature Schnauzer: 2 cases
- German Shepherd: 2 cases
- Cocker Spaniel: 2 cases
- Boxer: 2 cases
- Boston Terrier: 2 cases
- Basset Hound: 3 cases
- Golden Retriever: 8 cases
- Labrador Retriever: 12 cases
- Mixed Breed: 16 cases
Eyelid Histiocytoma (n=40)

Number of Cases

- Mixed Breed: 8
- Bichon Frise: 3
- Labrador Retriever: 4
- Boxer: 4
- Cairn Terrier: 2
- Jack Russell Terrier: 2
- Miniature Poodle: 2
- "Other": 15
Histiocytoma Age Distribution (n=40)
Canine Tumors of the Orbit (n = 285)

- Meningioma: 97
- Lobular Orbital Adenoma: 41
- Osteosarcoma: 19
- Fibrosarcoma: 19
- Other Sarcomas: 25
- Salivary Gland Tumor: 17
- Lacrimal Adenocarcinoma: 17
- Liposarcoma: 12
- Other: 38

Tumors of the orbit make up 285 out of 6110 total neoplasms - 5%.
Orbital Meningioma (n=97)

- "Other": 46 cases
- Yorkshire Terrier: 3 cases
- Poodle: 3 cases
- German Shepherd: 3 cases
- Dachshund: 3 cases
- Boston Terrier: 3 cases
- Bichon Frise: 3 cases
- Australian Shepherd: 3 cases
- Golden Retriever: 4 cases
- Chihuahua: 5 cases
- Boxer: 6 cases
- Mixed Breed: 7 cases
- Labrador Retriever: 8 cases

Number of Cases
Our data implicates the Chihuahua in Orbital Meningioma, but the sample size is too small to apply the odds ratio statistics in a meaningful way.
Lobular Orbital Adenoma (n=41)

- "Other": 19 cases
- Labrador Retriever: 9 cases
- Samoyed: 4 cases
- Mixed Breed: 4 cases
- Dachshund: 3 cases
Our data implicates the **Samoyed** in Lobular Orbital Adenoma, but the sample size is too small to apply the odds ratio statistics in a meaningful way.
Orbital Osteosarcoma (n=19)

- "Other": 9 cases
- Mixed Breed: 2 cases
- Cocker Spaniel: 2 cases
- Labrador Retriever: 3 cases
- Golden Retriever: 3 cases
Conclusions

While there may not be a lot of surprises here for those of you who have been in the field a while, we’re excited to put concrete numbers and statistics on paper.

The ever-more realized database capabilities of the C.O.P.L.O.W. lab make greater use of the massive collection of tissues and data.

We hope to dig deeper and to work from new angles in the years to come.
Special Thanks

Dr. Richard Dubielzig & Dr. Cindy Bell and all of my coworkers at C.O.P.L.O.W.

Credit for clinical, gross and histologic photos goes to RRD, several generations of C.O.P.L.O.W. fellows, and several of our referring ophthalmologists.