

## **Understanding Cancer at the Breed Level**

Rhonda Hovan

While cancer affects approximately one-third of all dogs, in some breeds the toll is much greater. This presentation will address some of the questions that breeders and owners commonly ask, such as: "Is cancer inherited in my breed?" "What caused my dog's cancer?" "How can I help my dog avoid cancer?" and "Can I avoid cancer in my breeding program?"

We will begin with a basic cancer primer, and then using Golden Retrievers as an example, we will discuss cancer as a genetic disease, theories that explain why some breeds may have more cancers than other breeds, modifying a dog's risk profile, and complex genetic interactions.

We will also discuss ways that Parent Clubs and health committees can encourage owners and breeders to submit samples from affected dogs to support research to benefit their breed.

### **Biographical Profile**

**Rhonda Hovan** has been a breeder/owner/handler of Golden Retrievers under the "Faera" prefix for over thirty years, producing more than 60 CH's. As a health and genetics writer, she has won the Veterinary Information Network Health Education Award and the Eukanuba Canine Health Award. Rhonda is the Research Facilitator for the Golden Retriever Club of America, founded the Starlight Fund at CHF to support Golden Retriever health research, and is an Emeritus Director of the Orthopedic Foundation for Animals. She is a frequent speaker on topics of canine health, and lives in Akron, OH with five Goldens and two rescued raccoons.

### **Understanding Cancer at the Breed Level – conference notes**

It is important to have an accurate breed survey to be able to see what type of cancers affect your breed.

Prepare Breeders in Advance

- To request pathology to correctly identify their dog's cancer

- To consider necropsy

- Don't report unconfirmed disease to open database

Cancer as a Genetic Disease

- Cancer is a genetic disease BUT not necessarily inherited

Genes in germ cells

- Inherited

Genes in somatic cells

- Mutations and not inherited

Very few cancers are the result of a single mutation.

All the common cancers in dogs require multiple genetic mutation.

Most cancers are both inherited and not inherited – genetically predisposed to it

Initiation

Cell endowed with immortality or other growth/survival advantage

Promotion

Progression

What is the single greatest risk factor of cancer?

Natural selection can favor health (no cancer) only prior to or during reproductive years

Cancer is rare in young animals

Cancer that occurred past ancestral reproductive age did not impact gene pool

Long lived individuals were not favored

Their contributions to the gene pool were no greater than animals with an average lifespan

Cancer can be considered part of the aging process.

Worldwide breed cancer data

Make effort to collect data from other countries that have established separate populations this will allow to get better overall data.

Breed specific cancer theories can be useful tool to help breeders understand cancer in their breed. It is not necessarily a fact.

Are cancer rates significantly different in different countries?

Are cancer rates different in different regions of the US?

If so, probably not a founder effect

Consider studying specific lines/families

Immune mediated diseases are also increased.

Allergies, atopy, hypothyroidism – may be a component of elevated heritable cancer risk profile.

Genetic bottlenecks/ popular sire syndromes – variations of founder effects

Can we reduce the risk of cancer by our breeding decisions? Not at this time

-Most breeds have not identified specific lines of more/less cancer risk

-There are no tools to identify dogs with greater or fewer hereditary risk factors for the common cancers

-Cancer genes in breeds are prevalent

Differences between middle aged dogs/ older dogs not getting cancer most likely due to genetic mutation. Longevity in parents is not usually predictive for longevity in offspring. Most pedigrees that appear long-lived for a couple generations do not provide full data. Extensive sibling and familial data is usually absent. Need to look at sibling/aunt/uncle data.

Effective risk reduction through lifestyle modification – environmental changes can reduce cancer risks:

Keeping them lean and fit:

Later age of onset cancer

Decreased incidence and severity of orthopedic diseases

Raw vegetables about 3x week, rationed meals

Reduce exposure to:

Coal/kerosene heaters

Fumes from paints/solvents

Asbestos

Second hand smoke

Herbicides: [www.alanwood.net/pesticides](http://www.alanwood.net/pesticides)

Pesticides (not flea – tick products)

Radiation

Fetal cells are especially vulnerable to damage because they are rapidly dividing

Large lifetime studies of high risk breeds has not been done

Balance risk vs. benefit

Epigenetics – above genetics/complex interactions and unintended consequences

Gene expression can be permanently modified before birth – in the womb

Prenatal is extremely important to the genes of newborns

soybeans in the asian diet kept them thin and trim and a bit more cancer free

hyperuricosuria – stone formers

defect in metabolism that sometimes causes stones in the urinary tract

A research colony in 1976 crossing pointers to Dalmatians, and in 5 generations they had hyperuricosuria free dogs, however the dogs did not have correct spotting. So it was decided that the spotting was part of the allele that causes the disease. They consider this as part of the risk of breeding Dalmatians.

Breeders select for desirable genes to keep in the gene pool. Breeds are closed gene pools that are under selection pressure to shrink. Selected desirable genes concentrated over time. If diseased genes are linked to desirable genes, they are also concentrated.

Should a Dalmatian change its spots? What part of your breed would you be willing to change?

Complex genetic picture is likely with cancer. Each dog is likely to carry a complex mix. Breeders may need to wait for a more complete picture to emerge before determining how to use genetic testing. Eliminating portions of the gene pool could cause more harm as genetic diversity is lost.

Ways to participate in cancer research. Publish the names and information about how to get samples to researchers. Encourage breeders to print information and have it readily available for their breeds and as well as their puppy people's vets. Don't forget to have breeders include CHIC repository information. Participants information is kept strictly confidentiality.

Encourage all breeders to get necropsies on all effected dogs - including these dogs in pet homes.

Create a culture of openness

Identify breeders who have had affected dogs. Have articles published in newsletters.

Feature well known affected dogs – do articles on them as well.

Purina publishes stories that weave a story about an affected dog with information about the newest research and therapies available. They are available for publication in breed magazines/newsletters.