January 2011

Golden Views

Official Newsletter of the Ottawa Valley Golden Retriever Club

THE HEALTH ISSUE

President's Message

Welcome to 2011!!

It is hard to believe that another year has gone by. Upon reflection, for each of us, I guess there were some great accomplishments, some disappointments, some new dogs in our lives and some that sadly left. Overall though, I sincerely hope and trust that there were more positives than negatives for each of you.

As a Club, we had a good year. Our obedience trials were well attended and successful. Our field events were popular and lots of fun and our Agility trials in conjunction with the Ottawa Valley Poodle Club attracted skilled competitors who seemed to enjoy themselves immensely. The volunteer dinner was successful as always. We are very proud to be able to offer this event to all our volunteers. Without volunteers, we would not be able to do what we do each and every year.

On behalf of the OVGRC Board of Directors, Darwin Boles, Sue Roberts, Ginny Chafe, Mary Ducross, Pat Enright, Deb Brunner-Walker, Ann Lambert, Kate McDermott and myself, I would like to wish you all a very happy and prosperous New Year.

Frances Holmes
President
Ottawa Valley Golden Retriever Club

Inside this issue:

Brags	2
Hemangiosarcoma FAQs	4
Easing Into Old Age	12
Arthritis	14
Blood Tests	16
Ear Care	19
Digestion	22
Food Supplements	26
Tick Borne Diseases	29

Rally-O Brag

Member Odette VanVlaarginen reports that her now 2-year old golden, Wilson, earned a perfect score of 200 from Novice B in his first Rally-O trial held in Brockville on October 9th. Here's a picture of a very proud Wilson with his ribbon.

Congrats! We're sure it's the first of many ribbons to come!

Frances Holmes was very proud of Radar (Motch Brackenridge's Speed Trap, WCI, JH, AG.MX, Am. CDX, Am MX, Am. AXJ) in November when he assumed the role of Sandy in the Orpheus production of the musical, Annie. Nine perfect performances!

Alan Dean Photography

Frances and Radar would like to thank Terry Pearce for her help during this time and all the people who came to cheer him on.

One of the best things about the experience was the joy in Radar's face when all those people came to pet him. With cast and crew, there were 90 people and just about every one of them came to see him every night for the several months we worked on this project. He was in his Golden glory!

The whole thing was a great ride. Thank you Radar. You are a great dog!!!!!

Health Surveys of the Golden Retriever

There have been two major health surveys of the golden retriever conducted to date. The Golden Retriever Foundation (GRF) in the United States funded the first comprehensive Golden Retriever health study in 1998. The primary objective was to describe the frequency and pattern of occurrence of health related conditions and causes of death in Golden Retrievers. A secondary objective was to relate physical traits, diet, environment, and personality of individual animals to certain diseases and longevity.

The Golden Retriever Club of America (GRCA) Health and Genetics Committee and Dr. Larry Glickman from the Purdue University School of Veterinary Medicine developed the questionnaire used in the health survey. The GRCA mailed the questionnaire to all members and placed a copy on the Club's web site. Each owner was asked to complete a separate questionnaire for up to five dogs that were alive on January 1, 1993. Seven hundred and forty six owners submitted usable responses directly to Purdue University for 1444 Golden Retrievers.

The results of this 1998 survey can be found at: http://www.goldenretrieverfoundation.org/insidepagesdata/healthsurvey/GRCA%20Health%20Survey.pdf

In 2004 a report was released by the United Kingdom Kennel Club and British Small Animal Veterinary Association of the Scientific Committee Summary results of the Purebred Dog Health Survey. The survey also contained a component specific to Golden Retrievers. A total of 3282 breed-specific forms were sent out and 538 were returned, representing 1717 live dogs or a 16.4% golden retriever specific response rate. A copy of the survey can be found here: http://www.thekennelclub.org.uk/download/1563/hsgoldenretriever.pdf

Of particular interest to golden fanciers is the data collected regarding mortality. The British study estimates the Golden Retrievers life expectancy at around 12 years. The Golden Retriever Club of America comes to similar conclusions: 10.7 years for males and 11.3 years for females. Larger females tend to die 1.1 years earlier than small females. That gap is 2.2 years among males.

Both studies listed cancer as the most common cause of death (61.4% of American goldens; 38.8% of British Golden Retrievers. Note: the second leading cause of death for goldens in the British survey was listed as "old age". Researchers on both sides of the pond have speculated that the percentage of goldens dying from cancer in the UK is in reality much higher but may be unreported as such due to differing practices in veterinary medicine interventions).

The British survey did not break down the cancer into type; according to the GRF survey, the most common cancer affecting goldens is hemangiosarcoma, followed by lymphosarcoma, mast cell tumour, and osteosarcoma.

Sadly, both surveys found that the overall incidence of cancer in Goldens is elevated as compared to all dogs. See the Hemangiosarcoma FAQ later in this newsletter for a more detailed look at some questions surrounding cancer in goldens.

Hemangiosarcoma FAQ's

The Golden Retriever Club of America (GRCA) Health & Genetics Committee

Well, let's get all the depressing articles done with first. A few years ago, the GRCA Health and Genetics Committee posted an FAQ about hemangiosarcoma and other issues surrounding cancer in goldens. Given that the latest health survey of golden retrievers estimated that approximately 1 out of every 5 goldens would succumb to this disease, we felt it was worth including. My apologies for the length of the article.

What is hemangiosarcoma, and how common is it in Goldens?
Hemangiosarcoma (HSA) is a cancer of the cells that line blood vessels, called endothelial cells. Since blood vessels are in nearly all tissues in the body, this cancer can arise in nearly all tissues. However, the spleen is the most common site for HSA tumor development, accounting for 50-65% of HSA tumors. Other common sites for HSA tumors are the heart, liver, lungs, brain, and skin. Hemangiosarcoma of the skin or underlying tissues is called cutaneous hemangiosarcoma, and hemangiosarcoma of the organs and deep tissues is called visceral hemangiosarcoma. As we read in the previous article on health surveys, data from the 1998 GRCA/GRF Health Survey (http://grca.org/pdf/health/healthsurvey.pdf) indicate that 18.7% of Golden Retrievers (nearly one in five) die from hemangiosarcoma at an average age of 10.3 years old.

What are the symptoms of HSA? It seems like they are very healthy and then 'boom,' they're gone literally hours later. Is it true that they will have a rash on their tummy? I've also heard that it can have signs that show up on an eye exam. Other people describe refusing food, weakness, and pale gums.
The clinical signs of HSA can vary with the part of the body affected. Tumors of the spleen and other internal organs often rupture, causing bleeding into the abdomen; or in the case of a cardiac tumor, into the sac around the heart (pericardium). Sometimes bleeding into the abdomen causes weakness, pale gums, lethargy, and loss of appetite for a few days, but gradually the lost blood is resorbed and the dog regains the appearance of good health. This waxing and waning of symptoms may be repeated through several episodes over the course of a month or more. Other signs of visceral HSA may include difficulty breathing, weight loss, abdominal distention, and generalized depression. Particularly with cardiac tumors, the first sign of disease may be sudden collapse and death; or abnormal heart function can cause weakness, pale gums, and labored breathing. In addition, the majority of dogs with hemangiosarcoma have blood clotting abnormalities at the time of diagnosis.

Cutaneous HSA may present as a "rash" on the abdomen, which is typically dark or purple in color, and often raised. It can also appear as a red or dark mass in or under the skin, which may or may not be ulcerated.

Many systemic diseases can be detected as nonspecific abnormalities during an eye exam, which is one reason that yearly eye examinations are recommended for dogs even long after their breeding careers are over. Some manifestations of HSA might be detected on an eye exam, and though this would alert the owner to seek follow-up care, it would not be diagnostic.

What are treatment options with HSA?
Unfortunately, treatment for visceral HSA currently is of very limited effectiveness. Surgical intervention to remove an accessible mass will provide relief from the clinical symptoms associated with internal bleeding for a period of time. Chemotherapy usually increases survival time, and may be offered as single agent therapy (typically doxorubicin) or multi-agent therapy. Newer immunotherapy protocols are available at some treatment centers.

With no treatment, survival time from the discovery of visceral HSA ranges from less than a day to about 8 weeks. Surgery alone increases survival time to approximately 3-4 months, while surgery plus chemotherapy has been reported to increase median survival time to more than 5 months (Sorenmo et al., 2004; Ogilvie et al., 1996). Early results with immunotherapy report median survival time of 273 days (Withrow and MacEwen, 2001).

Cutaneous HSA has a better prognosis. With small lesions that are restricted to the upper layers of the skin, surgery with

wide margins may be curative. With deeper or larger lesions, surgery plus chemotherapy may be recommended (Ward et al., 1994). However, when metastatic disease is present, chemotherapy is not curative.

As with all veterinary care, individual treatment decisions are best made between an owner and the treating veterinarian. When circumstances permit, owners may wish to consult with a veterinary specialist such as a board certified oncologist (http://www.acvim.org) to discuss options that may not be available at a general veterinary practice.

Does it ever happen that the spleen is removed due to HSA, and the dog is cured? Does the disease always metastasize? Is it ever recommended to remove an "at risk" dog's spleen to prevent HSA?
Though one hesitates to use absolute words like "never" and "always" to describe biological processes, in this case, it is very nearly certain that removing a spleen with an HSA tumor will not cure the disease. Further, removing a healthy spleen will not prevent this disease. Let's examine the disease process in greater detail to understand why.

Many people are aware that in humans, it is estimated that a breast cancer usually has been growing for an average of 8-10 years before the tumor reaches a size where it can be detected. Likewise, current theories in visceral hemangiosarcoma (and other cancers) estimate that the first mutant cells become cancerous several years before the tumor reaches detectable size (Etzioni et al, 2003; Wulfkuhle et al, 2003; Laird, 2003). Because the cancerous hemangiosarcoma cells may arise in any blood vessel in the body, they have ready access to circulating blood and can migrate freely through the body in the blood stream.

At some point a primary tumor site develops, and this is typically in a highly vascular organ such as the spleen, liver, or heart. In some malignant tumors, factors associated with the primary tumor actually suppress the growth of tumors that originate from cancer cells that have escaped into the blood from the primary tumor (O'Reilly et al., 1994). So although malignant cells from the primary tumor have nearly always spread elsewhere in the body, they may temporarily remain dormant while the primary tumor is growing. However, removal of the primary tumor is essential to prevent additional shedding of malignant cells, and to prevent problems associated with tumor enlargement and rupture. Unfortunately, in model systems, removal of some primary tumors can actually increase the growth rate of metastases because removing the tumor also removes the source of the factors that suppress the growth of secondary tumors (Barbour and Coventry, 2003; Ouatas et al, 2003). Thus, it is extremely likely that visceral HSA will have spread before the primary tumor is detected and it is even possible that removal of the primary tumor will actually increase the growth rate of HSA in the distant (metastatic) sites.

In addition, although a large proportion of primary HSA tumors occur in the spleen, there is only limited evidence that the original mutation to cancerous cells occurs in the spleen. Since the spleen functions as a filter to remove abnormal blood cells from circulation, a likely scenario is that hemangiosarcoma cells originating elsewhere are captured by the spleen, and then develop into the primary tumor. It is unlikely that removal of the spleen would prevent HSA, because the primary tumor can develop in alternate sites such as the liver or right atrium of the heart (obviously not candidates for prophylactic organ removal). Further, the spleen functions to aid the body to fight infections, and is certainly not a "disposable" organ that can be removed with no consequence to the dog.

At the 2000 National, a seminar was presented on HSA. Someone asked if there was any way to detect hemangiosarcoma with regular ultrasounds. The answer was that even twice-yearly ultrasounds might not catch rapidly spreading cancers, because they could develop in a dog's body and kill it within as short a stretch as six months. In response to this, a breeder shared that they had ultrasounded a Golden in late August, showing a normal heart. Then in mid-December, there was a lesion visible on the heart, which was confirmed as hemangiosarcoma. The dog died in late January. The earlier ultrasound showed a splenic mass, but the pathology report indicated a benign hematoma, not hemangiosarcoma. What use is ultrasounding when the cancer spreads and kills so quickly anyway?
As discussed above, current research indicates that by the time a tumor is large enough to be detected on ultrasound, the disease has existed for some time, and metastasis has already occurred. Even monthly ultrasounds would not "catch" HSA prior to metastasis. However, periodic ultrasounds might discover a primary HSA tumor prior to rupture, permitting removal of the tumor before it has spread its contents into the abdominal cavity (which may contribute to additional metastasis). This may add several months to the dog's survival time, and of course, will prevent sudden collapse and

death due to tumor rupture. However, approximately one-half of splenic tumors are benign, and these generally cannot be distinguished from HSA without surgery (Clifford et al, 2004). Thus, the potential benefit of discovering an HSA tumor prior to rupture, must be balanced against the possibility of surgery for a benign tumor. There are reasons that removing a benign tumor may also be of benefit, but we have found no studies comparing the risk and benefits of surgery for benign splenic masses. As always, the attending veterinarian is in the best position to make recommendations for the most appropriate health care and diagnostic procedures for the individual dog.

At what age is cancer considered to be a by-product of old age?
As implied in this question, some scientists consider cancer to be an expected occurrence as part of the aging process. Cancers develop when multiple sporadic (non-heritable) mutations permit cells to divide out of control, or not die when they are supposed to. Each time a cell divides, there is an opportunity for a mutation that contributes to cancer to occur; and the more cell divisions there are, the more chances there are for a cancer to begin. Obviously, an older animal has had more cell divisions in its lifetime than has a younger animal, and thus, the odds of accumulating cancer causing mutations rise as an animal ages. In addition to numerical odds being in their favor (because of fewer cell divisions), younger animals are also protected against mutations better than are older animals. These protections permit time for animals to reproduce. Loss of these protections also contributes to cancers that occur in older dogs.

So at what age is cancer "normal" and at what age is it too young? There is no single answer, because we really don't have sufficient data yet to determine what assessments might be most valuable for predicting risk to the future generations of Goldens. One way to consider the question might be to examine the average age of death from certain cancers in this breed – for example, 10.3 years for hemangiosarcoma, and 8.5 years for lymphoma. One might feel that when these cancers occur after these ages, it is better than the norm for those cancers. Or, one could use the average life span in the breed (10.7 yrs for males, and 11.3 yrs for females), and make a case that only cancers that occur after those ages can be considered old age cancers. As a very general rule, cancers that occur in young animals have the highest likelihood of a more significant heritable genetic component.

How much cancer can be attributed to environment and how much to genetics?
Science is still far from answering this question in dogs, as we are only beginning to glimpse the intricate interactions between genes and the environment. Since much more is known about this topic in humans than in dogs (although not nearly fully understood in humans either), perhaps we can draw some understanding from human medicine.

In some human cancers, such as breast and colon cancer, it is known that a person's risk of developing those cancers is increased if he/she has multiple first-degree (parent or sibling) or second-degree (grandparent, aunt, uncle) relatives with the disease. Yet, the vast majority of affected persons **do not** have a family-history risk factor. So while there is a genetic component, clearly something else is going on too. Some of those other factors have also been identified, and include a high fat diet and a sedentary lifestyle. Yet not all sedentary people who eat a high fat diet and have affected family members get breast or colon cancer. In fact, most don't. And many active people who eat moderate fat diets and have no family history, **do** get breast or colon cancer. So again, clearly something else is going on.

Examining this in greater detail, it is widely known that researchers have identified certain specific genes in humans that contribute to cancers, such as the *BRCA1* and *BRCA2* genes, which can play a significant role in breast and ovarian cancers, and several other cancers. For example, a woman with one of these genes faces a 3- to 7-fold increase in her risk of developing breast cancer, and will often develop cancer at a younger age, as compared to the general population. And yet, only 5-10% of American women with breast cancer have these genes (Data used in this and the previous paragraph is from The National Cancer Institute, available online at http://www.nci.nih.gov/). It is likely that for many affected people, their breast (or colon) cancer arose at least in part as a result of unlucky sporadic (chance) mutations, or other factors which are not yet understood.

As we learn more about cancers in dogs, it is very likely that we will find a similar puzzle emerging. One piece of the puzzle may include one or more genetic risk factors, another piece may include some environmental or lifestyle risks that are identified, and other pieces will include factors that aren't identified. As with most breast and colon cancers in humans, it is likely that that no single factor plays a predominant role. And then there is luck – or lack of it – played out over the lifetime of the dog each time a cell divides.

However, there are several important clues that lead to some basic theories of cancer genetics in Goldens. First, it appears that the overall incidence of cancer in Goldens in the US and other countries such as the UK is elevated as compared to all dogs. For example, the overall rate of death due to cancer among US Goldens (66% of males, and 57% of females, according to the 1998 GRCA/GRF Health Survey) is higher than is the death rate from cancer among all dogs (Craig, 2001). In the UK, the incidence of lymphoma is 162% higher in Goldens than in all dogs, and the incidence of mast cell tumors is 190% higher (Edwards, 2004). These elevated rates of cancers in Goldens are a strong indication that there is a heritable component to overall cancer susceptibility within the breed.

However, hemangiosarcoma in particular does appear to have an increased incidence in the US as compared to the UK. (Edwards, 2004) This is an indication that specific gene pools or lines may possibly be implicated as having increased genetic contributions to the development of HSA in US Goldens.

And finally, some differences at the cellular level of specific cancers have been identified that seem to segregate within certain breeds of dogs, including Goldens. This is another indication that there may be a heritable component to specific cancers within our breed.

Taken all together, a working theory has emerged. It is possible that early Golden Retrievers had genes that confer an elevated degree of cancer risk, and that these genes have become common and widely dispersed over countless generations of breeding within a closed gene pool. According to this model, the inherited susceptibility for cancers is widespread throughout the breed, and it is possible that no lines are exempt from a certain degree of elevated risk (as compared to all dogs). However, some lines within the breed also may be at additional increased risk for specific cancers, including hemangiosarcoma. The mechanisms behind this increased genetic risk for cancers can include inheriting some of the steps in the progression toward cancer, or inheriting an increased susceptibility to environmental triggers of cancer causing mutations (Cavenee and White, 1995; Feigelson et al., 1996; Minamoto et al., 1999; Knudsen., 2001; Kamb et al, 1994). (For a more detailed discussion, see http://grca.org/pdf/health/perspectives.pdf)

What has changed to explain the increase in cancer in recent years? Has it always been there and just been undiagnosed?

Unfortunately, we really do not even know if there has been an increase in cancer in recent years. Certainly, our dogs are not succumbing to infectious diseases at the rate they were many generations ago, and this has contributed to a long term trend toward alternate causes of death. And there may be a greater likelihood of accurate diagnosis in recent years, though this is not certain either. One factor that may influence the perception (real or not) of more cancer, is the current use of chat Lists to share information. As a result, most of us have heard many more anecdotal accounts of affected dogs than we would have been likely to hear even 10 yrs ago. Even popular online databases give us access to more information than we would have had in previous generations.

The good news is that the 1998 GRCA/GRF breed Health Survey has now given us some baseline data with which to compare and track future trends in cancer and other diseases. This promises to be very useful, and it is likely that a new health survey will be conducted in the near future.

Although not directly a cancer statistic, the 1998 survey does indicate that the average lifespan of Goldens (11.3 years for bitches and 10.7 years for dogs) is very similar to the 10 years reported for mixed and purebred dogs in one Danish study (Proschowsky et al., 2003) and the 11.1 years reported in a British study (Mitchell, 1999).

Does hemangiosarcoma occur more often in close relatives? What breeding recommendations are there for a dog that had a close relative die from HSA?

This is another question about which we do not have good data. There is a common perception that certain lines have an increased incidence of hemangiosarcoma, and this may, in fact, be the case. However, even disturbing circumstances such as several littermates diagnosed with HSA, may not be too far outside the norm. For example, with a rate of 18.7% HSA in the breed, on average, a litter of 10 pups would contain one to two affected dogs. And even a third affected littermate may not be numerically extreme. If one were to extend the consideration to all cancers, on average, this would

amount to 6 of the 10 littermates succumbing to cancer. It is very difficult for breeders and scientists to accurately understand what is really going on with these pedigrees, especially when examining small or incomplete data sets (such as only a couple of litters by a prolific sire, or only a few littermates out of a larger litter).

To better illustrate the complexities of accurately understanding family histories, it might help to consider once again the human examples of breast and colon cancer. Extensive studies have led to very specific guidelines to assist patients and physicians in determining who is likely to have inherited risk factors for certain cancers. Note that the guidelines (reproduced below from Murff et al, 2004) are different for each cancer, and are much more detailed than simply knowing that "several relatives" had a certain cancer:

Example 1 Hereditary Nonpolyposis Colon Cancer (HNPCC)
All of the following criteria should be present:

- At least 3 relatives must have cancer associated with HNPCC (colon, endometrial, ovarian, stomach, small bowel, hepatobiliary, ureter, renal-pelvis, brain)
- One should be a first-degree relative of the other 2
- At least 2 successive generations should be affected
- At least 1 of the relatives with cancer associated with HNPCC should have received the diagnosis before age 50 years.

Example 2 Hereditary Breast/Ovarian Cancer
Any of the following criteria should be present:

- Two breast cancers in a first- or second-degree relative and mean age at diagnosis of 40 years
- One breast cancer and 1 ovarian cancer in a first- or second-degree relative and a mean age at diagnosis of 41 to 50 years
- Two or more breast cancers and 1 ovarian cancer in a first- or second-degree relative
- Ovarian cancer in 2 relatives
- Identified relatives for all of the above must be on the same side of the family (either maternal or paternal relatives)

Clearly, we are very far from these kinds of precise guidelines to help us make sense of canine pedigrees (family histories) as they pertain to hereditary risks of cancer. So how can breeders approach the problem of understanding pedigrees as they pertain to risk of cancers? There are several steps that are likely to help in the long run, though results may be frustratingly slow.

First, breeders can keep records on the dogs they produce, and owners should inform their breeders of cause of death. Obviously, cause and age of death records can only be accumulated over the long term, but if one does not start somewhere, one will never get anywhere. Necropsies should be performed on dogs for whom the cause of death is not known, and it is important to keep medically accurate records that include the specific kind of cancer diagnosed, and age at diagnosis or death. A common error is that owners sometimes note only the organ that contained the primary tumor ("spleen cancer"), rather than identifying the cancer as a hemangiosarcoma or other specific neoplasia. A tissue sample sent out for a pathology report may be necessary to obtain an accurate diagnosis.

Second, it does little good if each of us keeps records, but does not share that information. Islands of data are much less meaningful and reliable than are networks of data. Unfortunately, disclosure of information through open health registries or directly to individuals to whom it may be relevant, takes courage and conviction in the current dog breeding culture – which leads to the next point.

If we really want to have a chance at improving our understanding of family histories, it is important to resist the impulse to: 1) point fingers 2) spread rumors 3) condemn 4) keep secrets 5) leap to the most negative conclusion possible 6) over simplify this complex disease 7) shun those who disclose information 8) accept "I don't know" for an answer, and 9) automatically reject pedigrees with negative data, without considering all of the nuances. If we want a culture of openness that will ultimately benefit our dogs, we are all equally and individually responsible for creating it – every time we pick up the phone, send an e-mail, or talk ringside.

Unravelling the pedigree genetics of cancers will take a mature, selfless, committed, long-term, and united effort. There are no quick or easy answers here. As breeders embark on this task, there are several important genetic concepts to understand. First, as with any complex genetic trait, complete or nearly complete vertical pedigree data (sibling data) is at least equally as valuable as is horizontal pedigree data. (For a full discussion of vertical pedigrees, see http://www.offa.org/hovanart.pdf) That means that information on the "invisible" dogs that went into pet homes may add up to be more important than data on the "visible" dogs that went into show homes, since there are typically far more of the former than of the latter.

Finally, with all of that as background, we return to the question of what breeding recommendations there are with regard to a dog whose close relative had hemangiosarcoma. Begin by putting this in the perspective that since approximately one in five Goldens gets HSA, if this cancer is randomly distributed thru the breed, accurate data on at least 10 close relatives over the age of 10 years (parents, siblings, aunts, uncles), would suggest that most Goldens have a close relative with HSA. From there, compare the most complete pedigree data available to what is known to be average for the breed. Include the nuance factors such as age of onset (cancer at 12 yrs old may not be weighted the same as cancer at 6 yrs old), and number and ages of dogs on which data is available (a dog that has produced 100 offspring of older ages will usually have more affected offspring than will a dog that has produced 25 offspring that are still young). As this data comes together, sometimes a pattern may emerge which may make it appear that the line is average, above average, or below average in its incidence of HSA (and other cancers).

The genetic significance of such a pattern cannot be stated with certainty, but it is possible that there are Golden lines with a stronger genetic susceptibility to hemangiosarcoma and perhaps to other cancers. If the data leads in that direction, such lines should be bred sparsely and cautiously, and efforts should be made to choose alternative lines in breeding programs. However, dogs from these lines are ideal candidates for inclusion in studies which seek to identify genes that may predispose Goldens to hemangiosarcoma. Through participation in research, these dogs have the opportunity (and their owners have a special responsibility) to make a contribution toward potentially developing DNA tests that may help breeders reduce the incidence of hemangiosarcoma in the future.

Are there studies which show that cancer happens more often in dogs with high COI's? If so, what is the recommended percentage at or under which we should breed?

There are few studies examining cancer rates for dogs with various coefficients of inbreeding (COI's). One study (Dorn et al, 1976) compared the COI's in purebred dogs with mammary cancer, other cancers, and healthy dogs; and the COI's in the three groups ranged from .000 to .535. While the two groups with cancers did have numerically higher average COI's, it was not considered to be a statistically significant difference. (A statistically significant finding is a one that is not likely to have happened by chance.)

Taking a broader view of health considerations, many studies in commercial animals such as cows and pigs, have shown that inbreeding depression can result in reduced fertility, slower growth, higher neonatal mortality, and other specific findings such as decreased milk production in cows. A small study of Bouvier des Flanders in the Netherlands (Ubbink et al, 1992) showed higher average COI's for dogs with several genetic diseases than for the normal controls, but this study did not note any results specific to cancers. Very highly inbred strains of laboratory mice (such as brother x sister breedings for 100 generations) usually have decreased overall life spans as compared to outcrossed strains.

There has long been a concern that repeated inbreeding (high COI's) may result in such significant loss of genetic diversity that highly inbred animals may be extremely vulnerable to infectious and other serious disease. This is of particular concern to conservationists attempting to preserve species that have been reduced to dangerously low numbers. However, as often happens with scientific theories, the data is not always as straightforward as the theory, and it turns out that Nature may have some tricks up her sleeve to preserve essential genetic diversity under even extreme circumstances.

A very recently published study (Aguilar et al, 2004) of the San Nicholas Island fox found surprising results. Approximately 10-20 generations ago (1970's), the isolated fox population on this island was reduced to under 10 individuals (probably about 5). It has since rebounded and repopulated the island to over 500 foxes, but with an entirely inbred population with extremely high COI's. It is the most monomorphic population in a sexually reproducing animal ever

reported, showing no variation in most of the genetic markers examined. Yet geneticists were startled to find remarkably high levels of variation in the Major Histocompatibility Complex (MHC), which are genes that influence disease resistance. Of course, natural selection guided those breeding choices, not Man, and that is a very significant difference. But this example at least serves to remind us of how much we don't fully understand yet.

Are tight line-breedings (high COI's) the main contributors to cancer or are there other issues, such as the use of popular stud dogs and the result of not being able to find pedigrees without some risk factor? What about heavy linebreeding on dogs that don't appear to have cancer in their pedigrees?
Although from the above discussions it should be clear that we do not understand all there is to know about how linebreeding and high COI's affect cancer, it would probably be safe to say that we cannot "blame" cancer on modern day linebreeding and high COI's. Data on cancer as a cause of death in dogs varies greatly, but one study (Bronson, 1982) indicated that 39% of all dogs succumb to cancer. By age, this ranges from 20% of dogs at 5 years of age, and increases to 40-50% of dogs from 10 years of age onward. This study included both mixed-bred and purebred dogs, so COI's also ranged widely, and low COI's did not protect these dogs from cancer. On the other hand, a study in Denmark indicated that purebred dogs – which by definition have some degree of inbreeding and thus higher COI's than most mixed bred dogs – have a slightly decreased median lifespan of 10.0 years relative to mixed breeds with a median lifespan of 11.0 years (Proschowsky et al., 2003). However, this finding was not absolute, as some small purebred breeds had a longer lifespan than the mixed breeds, and a few breeds had a much lower median lifespan of 7 years. This study indicates that lower COI's might offer some advantage toward overall longevity.

It is not known whether Golden Retrievers with higher COI's have any greater risk of developing cancer than do Goldens with lower COI's. However, since many human cancers and at least some canine cancers can have hereditary tendencies (Padgett et al., 1995; Lingaas et al, 2003), a prudent approach might include avoiding repeated line-breeding or inbreeding, especially using dogs or lines that may be suspect. As discussed previously, however, it is impossible to identify such dogs and lines without a great deal of data. It is not enough to note a few related individuals with hemangiosarcoma and conclude that a dog or a line is at higher risk than average. (In fact, such premature conclusions are exactly the kinds of reactions that people fear when they make decisions not to disclose information.)

The converse is also true when investigating pedigrees that might have a lower than average risk of cancer. It is not enough to know a dog and his parents all lived to 13 with no cancer, because many of the siblings and aunts and uncles may have been affected, bringing the line into the average range in its rate of cancer. Unfortunately, such extensive data is not typically available. However, when substantial amounts of data **do** indicate a higher than average incidence of hemangiosarcoma (or other cancers) in specific lines, it is the responsibility of those involved to take steps to reduce the genetic contribution of those lines. No one sets out with the intention of producing dogs with cancer, and it is nothing to be ashamed of when a dog is diagnosed, or even when multiple dogs are diagnosed. But conscientious breeders step forward at these difficult times to accept appropriate responsibility, disclose relevant information, and change direction if necessary to improve the health of the breed.

What can we do to give our Goldens the best chance of not succumbing early to cancer? Please address such factors as less vaccinations, stress, pesticides, radio and microwaves, systemic medications like Heartgard & Frontline, better nutrition, etc.
Epidemiological studies previously published (Raghavan et al, 2004; Glickman et al, 2004) examined the relationship between a common genetic cancer (bladder cancer) in Scottish Terriers, and exposure to spot-on flea and tick products, and exposure to lawn chemicals. Results showed no increased risk for dogs exposed to spot-on flea and tick products, no increased risk for dogs exposed to lawn insecticides, and no increased risk for dogs exposed to nonphenoxy herbicides. Exposure to phenoxy herbicides was associated with an increased risk of bladder cancer in Scottish Terriers.

The 1998 GRCA/GRF Golden Retriever Health Survey found a **decreased** risk of hemangiosarcoma (and lymphoma) in association with use of spot-on flea and tick products (ed note: and studies are finidng an increased risk to these cancers for dogs who have been aaffected by a tick-borne disease). It also indicated no increase in cancer in Goldens exposed to lawn chemicals. There is no evidence at this time to suggest that vaccinations, stress, radiowave or microwave exposure, or heartworm preventative are associated with hemangiosarcoma or other cancer in dogs. However, there is evidence to

suggest that dietary manipulation may have very beneficial effects.

First, there are a few foods and supplements that which may have some protective benefits against cancer. The antioxidants beta-carotene, lycopene, and vitamins A, C, and E, and the mineral selenium may be of benefit. In addition, supplementation approximately three times per week with broccoli, cauliflower, or cabbage may have protective effects.

One of the healthiest things that any of us can do for our dogs is to grow our puppies slowly by strictly limiting food intake, and to keep our dogs very trim throughout their lives. Slowly grown puppies, kept trim as adults, showed significantly reduced rates of cancer, and an older age of onset of cancer, as compared to their littermates that served as a control group (Kealy et al,2002). Overall, the trim dogs enjoyed a median life span that was 22 months longer than the littermates. In addition, the food-restricted dogs had lower rates of osteoarthritis, liver disease, and false pregnancies than did their pair-mates. Restricted food studies have shown similar results in a variety of other animals including mice and rats, and preliminary results in rhesus monkeys. **There are no breeding selection factors that are known to have as great an impact on overall longevity as this study indicated is possible with calorie restriction.**

Finally, there is another important way that owners can help reduce the toll that hemangiosarcoma and other cancers take on Golden Retrievers. The Golden Retriever Club of America (http://www.grca.org), The Golden Retriever Foundation (http://www.goldenretrieverfoundation.org), and AKC Canine Health Foundation (http://www.akcchf.org) are actively involved in supporting and promoting numerous research studies investigating several kinds of cancer. As funding organizations, GRF and CHF have devoted a significant proportion of their resources to canine cancer research, with resulting papers regularly appearing in scientific journals. The achievements have been impressive, especially considering that privately funded canine cancer research was almost nonexistent just a few years ago.

Of course, expectations should be kept to a realistic level. It's been over 30 years since President Nixon first declared "war on cancer" in humans, and some people probably wonder sometimes if we're winning or losing that war. But although cancers continue to be a major human health concern, progress against the disease has been remarkable. Many, many cancers that were once deadly have become curable or manageable over the last three decades. Further, a number of genes that influence a person's risk of specific cancers have been identified and developed into DNA tests. Comparable tests in dogs would offer breeders a powerful tool to help guide breeding decisions. Progress against human cancer is made on a daily basis, though usually in small increments rather than in leaps and bounds. This should be our expectation for canine cancer research too.

Still, canine cancer research **is** moving forward toward an ever brighter future for our dogs. And to a great extent, the process is driven by money – the greater the resources available to fund the research, the more research that will be done. Thus, concerned owners have it in their power to influence the pace of this research and increase the potential benefit to dogs by donating to Golden Retriever cancer research via the GRF Zeke Fund (http://goldenretrieverfoundation.org/zekefund.html). The Golden Retriever Foundation has recently produced an excellent video, with copies provided to each local Golden Club. The Health & Genetics Committee highly recommends that each Club show this video at meetings or other events, and perhaps consider using it to spur new fund raising efforts to support the Zeke Fund.

In addition, owners can contribute toward progress against canine cancer by permitting their dogs to participate in research. This usually involves supplying a pedigree, blood, and/or a tumor sample, as required by individual studies; or in some cases, dogs may participate in clinical trials of new therapies. Yet despite notices in every issue of the GRNews, and on the GRF and GRCA web sites (http://grca.org/pdf/health/GRresearch.pdf), recruitment for participation in these studies is far below where it could and should be. Nearly every Golden breeder at one time or another, has the sad but hopeful opportunity to refer dogs to these studies, but only a small percentage of the GRCA membership actually does so. This is another area in which there is an opportunity to make a real difference – perhaps not for one's own Golden, but for those of future generations.

Senior Health - Easing Your Dog Into Old Age

Eve Adamson

There has never been a better time to be a "mature" pet. The advances in veterinary medicine since your pet was a puppy or kitten are truly remarkable, and help veterinarians to identify and combat the common problems associated with aging. Our pets are living longer, healthier lives than ever before.

Old age is difficult for dog and owner, but you can make your aging dog's existence easier and happier. Dogs are creatures of habit, and the older a dog becomes, the more it depends on its schedule. If your dog is losing its sight or hearing, don't rearrange the furniture in your house. An older dog is intimately familiar with its house and doesn't necessarily need to see or hear to get around -- unless you pull a fast one and move the couch and the end table. Don't change your dog's eating or sleeping habits, and try not to alter your dog's daily routine. Any household disruption will be stressful to your dog so try to minimize the effects by keeping it out of the way of chaos.

Older dogs need to be groomed and periodically examined for abnormal lumps but also touched and cuddled to reassure them the dog-owner bond is still intact. Touch is an extremely important factor of life for older dogs, especially those who can't hear or see well. Let your dog know you are still there. Thank your senior dog for a lifetime of love, loyalty and companionship. Your dog has devoted its life to loving you. The least you can do is everything possible to keep your aging dog healthy, fit and confident in your affection.

How Old is Old?

The rule of thumb that one human year equals seven dog years is not exactly true. A toy poodle is full-sized, physically mature in less than one year. An English Mastiff can reach old age in six years. The onset of age related disorders in cats is very variable. To keep things simple, we suggest geriatric testing at eight years old for all pets except the true giant breeds - St. Bernards, Mastiffs, etc., who should be tested at age six.

Senior Pet Checklist - What to Watch For

It is normal for pets to slow down with age, just as humans do. However, many problems, such as the onset of arthritis, are treatable and are not a "normal" stiffening of the joints. Also, dog owners can't be expected to catch every sign that their dogs may be suffering from a serious condition. Owners can, however, watch for a few general indicators of disease. Call your veterinarian if you notice any of the following behaviors in your pet:

- *Coughing, panting, shortness of breath*—They could mean your dog is becoming overweight. However, they also could signal a heart condition. Fainting is another serious sign of heart disease.

- *Weight loss or any change in weight*—Most weight gain is caused by overfeeding and leads to obesity, which can predispose your dog to diabetes. Weight loss for no apparent reason can indicate a number of serious problems.

- *Increased water consumption*—Most of us don't know how much our dog drinks, but if you notice that you are filling the water bowl more than usual or that your dog seems constantly thirsty, your dog could have diabetes.

- *Increased frequency of urination*—This can accompany increased water consumption and be another sign of diabetes, or it could signal urinary or even neurological problems. If your dog suddenly can't last through the night without going out or starts having accidents in the house, call your veterinarian.

- *Changes in appetite*—Diabetic dogs have an increased appetite but also lose weight, because they can't burn sugar for energy. They burn fat instead. A declining appetite can signal liver or kidney disease.

- *Vomiting and diarrhea*—These are obvious symptoms of illness. Periodically examine your dog's stool. Firm, brown stools are healthy; soft stools or those with blood or mucus can indicate many problems, including digestive disorders.

- *Sudden behavioral changes*—Becoming more or less interactive with the family, acting disoriented or lethargic, displaying disturbed sleeping or waking cycles, aimless wandering, inappropriate vocalizing, withdrawing increasingly and losing house training may all signal cognitive disorder, a condition similar to Alzheimer's Disease. Cognitive Dysfunction Syndrome is a condition in older dogs for which medication is available.

- *Decreased vision or hearing*—Examine your dog's eyes for cloudiness. Does he bump into things or seem to have trouble recognizing people he knows? Does your dog fail to respond when you call, seem surprised when you come home or become startled when someone walks in the door? One good way to test whether your dog is actually experiencing hearing loss or is merely being "selectively deaf" is to turn on the electric can opener or jingle the cookie jar lid. If your dog can hear, he'll come running.

- *Sudden onset of bad breath*—This can indicate dental problems.

- *Lack of mobility*—If your dog has more trouble getting up in the morning, it could be suffering from arthritis or age-related changes in muscle tone.

- *Changes in skin and coat*—Rougher skin, coarser hair and graying are signs of age or poor health.

- *Fatigue while exercising*—Older dogs should receive moderate exercise, but watch for excessive panting and a drooping tail. These are signs your dog is tiring. Exercise helps maintain your dog's lean body mass -- but don't overdo it.

- Additional signs to watch for include: difficulty chewing or swallowing; non-healing sores; tremors/shaking; change in the size, color, firmness of lumps, bumps, warts, etc.

You know your pet best. Any sudden or significant change in your pet's usual eating, exercise or behavior patterns can signal an underlying problem.

Senior Pet CheckUp - Recommended for all pets eight years and older

The comprehensive physical exam is the most under-appreciated aspect of health care. In the past, veterinarians stressed vaccinations as the reason for a yearly visit. The physical examination is the single most important reason your veterinarian needs to see your pet. Major health problems can be detected with a physical exam. Pets age faster than humans and hide health problems. Don't neglect your pet's physical. A comprehensive checkup is recommended at least once a year for all pets age 8 and older.

Test or Procedure	**Targeted Systems or Conditions**
Comprehensive Physical Exam	Overall health: weight, lymph nodes, skin, coat, lumps, bumps, heart/lungs, teeth, eyes, etc.
Blood Chemistry Tests	
- BUN/CREA/Phos and more	Kidneys
- ALT/ALKP/Amylase/bilirubin	Liver, pancreas
- Glucose	Diabetes
- Calcium	Some cancers
- Electrolytes	Hydration, hypokalemia
- Urinalysis and total protein	Kidneys, bladder, crystaline urine
- Pack cell volume	Anemia
- CBC	Immune status, infection, anemia, some cancers
- Thyroid test (T4)	Thyroid

Adding Pep to Their Step - Managing Canine Arthritis

Dr. Dawn Burke, YGRR Board of Directors

Arthritis is a common disease condition, especially in the older dog. Simply put, arthritis is inflammation of the joint. It can affect any joint but is most common in the hip, stifle (knee), elbow, shoulder, hock (ankle), carpus (wrist), and spine. Arthritis can develop as a result of long-term stress on a joint (e.g., obesity), injury, poor conformation, genetic predisposition (e.g., hip and elbow dysplasia), immune-mediated disorders (e.g., rheumatoid arthritis), or a combination of these factors.

Signs of arthritis include stiffness, limping, abnormal gait, and difficulty climbing stairs, getting in and out of the car, jumping on furniture, or getting up from lying down. Acting withdrawn (spending less time playing and interacting with the family) and increased aggression (due to pain) can also be signs. While arthritis cannot be cured, things can be done to help your dog be more comfortable and live a happier life. Ideally, treatment for arthritis uses a multimodal approach, meaning several therapies combined achieve better results than any single treatment. In overweight dogs, weight reduction is an important part of a treatment plan. Many dogs feel much better after taking off those extra pounds, and weight loss results in less stress on the joints helping to slow down progression of the disease. If your dog is overweight, discuss an appropriate diet and weight reduction program with your veterinarian.

Regular exercise is also important for the arthritic dog. Walking and swimming are very good low impact exercises. Exercise helps to strengthen the muscles and improve flexibility of the joints, as well as aiding in weight reduction. Physical therapy is also an excellent way to help your dog. Speak with your veterinarian about the availability of physical therapy services in your area.

Nutraceuticals – nutritional supplements that have medicinal properties – are often used in the treatment of arthritis. Examples include glucosamine, chondroitin sulfate, MSM, fish oil and omega-3 fatty acids. Some nutraceuticals help to supply the building blocks to repair cartilage while others aid in controlling inflammation. Most nutraceuticals can take weeks to months of use before you notice beneficial effects. Since these products are considered nutritional supplements, they do not have to undergo the rigorous testing for effectiveness and safety that prescription drugs have to go through. It is best to consult your veterinarian about which nutraceuticals may be helpful for your dog.

When a dog is already showing signs of discomfort from arthritis more potent medications are needed. Non-steroidal anti-inflammatory drugs (NSAIDS) are the mainstay of arthritis treatment. These drugs provide fast-acting relief by suppressing inflammation. While occasionally aspirin can be used in dogs, never give any human medication, over-the-counter or prescription, to your dog without consulting your veterinarian, as many human NSAIDS (e.g., ibuprofen) are toxic to dogs. The newer NSAIDS developed for use in dogs (e.g. carprofen, deracoxib, meloxicam, firocoxib, tepoxalin) have fewer side effects on the gastrointestinal tract, liver and kidneys. None of them can safely be combined with one another. Because NSAIDS are broken down by the liver and kidneys and have some potential for side effects on these organs, your veterinarian may want to perform a blood test to evaluate your dog's liver and kidney function prior to starting treatment. Dogs that are on long term NSAIDS should have periodic blood tests to monitor their liver and kidney values. Discuss with your veterinarian how often your dog should have these blood tests done. Always give the medication as directed and never change the dosage without first talking to your veterinarian. If your dog shows side effects like vomiting, diarrhea, or poor appetite, stop the medication and contact your veterinarian.

Analgesics can sometimes be used in combination with nutraceuticals and NSAIDS to help treat arthritis. These drugs (e.g. tramadol and gabapentin) do not control inflammation but help to control pain. If your dog's pain does not seem to be as well controlled as you feel it should be, talk with your veterinarian about adding an analgesic.

On occasion, corticosteriods may be used to treat arthritis. While they are potent anti-inflammatory drugs, they are not recommended for treatment of arthritis due to their side effects. Long term use can also worsen arthritis by causing muscle atrophy (wasting) and damage to the cartilage surfaces. The exception to the use of corticosteroids is in cases of immune-mediated arthritis such as rheumatoid arthritis.

Alternative medicine treatments like acupuncture and herbal remedies may be beneficial to the arthritic dog. It is best to consult a veterinarian who specializes and has advanced training in this field if you are interested in trying alternative therapies. Although surgical replacement of multiple arthritic joints is a routine procedure in human medicine, only hip replacement is commonly performed in veterinary medicine today. For dogs with severe hip arthritis whose pain can no longer be managed through medical and physical therapy, hip replacement offers an excellent chance for return to pain-free function.

As you can see, there are many options for treatment of the arthritic dog. Early and proper diagnosis is important. Exercise and weight management are equally as important as drug therapy. If you suspect your dog has arthritis, talk with your veterinarian about what treatment options are best suited for your dog.

New Guide to Golden Retrievers

A newly revised guide for Golden Retriever owners has been put online by Royal Canin

Although I am by no means recommending Royal Canin Golden Retriever 25 food, their newly released golden retriever guide is quite interesting. In it, they have summarized the results from a number of golden retriever health surveys. Check it out at:

http://products.royalcanin.us/products/dog-food/golden-retriever-25.aspx

The Importance of Blood Tests

Many veterinarians recommend that senior dogs have complete physical examinations and tests twice a year. A comprehensive physical exam targets the dog's overall health by checking his weight, lymph nodes, skin, coat, lumps, bumps, heart/lungs, teeth, eyes, etc. etc. Blood chemistry tests evaluate the functionality of his organs and can detect conditions or diseases before symptoms emerge.

Understanding Blood Tests

CBC (Complete Blood Count)
The CBC evaluates red blood cells (RBCs), white blood cells (WBCs) and platelets and can indicate the presence of an infection or disease or a deficiency of red blood cells or platelets.

RBCs are important because they carry oxygen from the lungs to all body tissues. RBCs can be measured directly by counting them under a microscope or automatically with a specialized machine.

An indirect measurement of RBCs can be made by measuring the volume of red cells as a percent of the whole blood. This is called a hematocrit or packed cell volume (PCV). A low hematocrit and a low RBC count both indicate the presence of anemia. A high hematocrit can indicate dehydration.

WBCs are important for preventing and fighting infection. WBC numbers increase when the immune system is stimulated, such as an in an infection, parasitic disease and allergies. There are five types of WBCs. A CBC includes a count of total WBC number as well as a differential. A differential is a determination of the different types of WBCs.

Platelets are thin, disc-shaped cells. The platelet count is important because platelets play a crucial role in the clotting of blood, along with coagulation factors produced by the liver.

Blood Chemistry Panel/Profile
To evaluate how the body is functioning -- are the kidneys working, how is the liver, is the pancreas functioning normally -- a veterinarian will run a panel of tests which examine the proteins, enzymes and metabolic by-products in the blood plasma.

Kidney Function
Measurement of the creatinine and blood urea nitrogen (BUN) are used to evaluate kidney function. Concentrations of both creatinine and BUN are normally low. If the kidneys stop doing their job, both BUN and creatinine concentrations rise because the kidneys are unable to excrete them efficiently. This makes them good indicators of kidney function. Dietary phosphorus is excreted primarily by the kidneys. In patients with chronic kidney failure, phosphorus is not excreted properly and results in elevated phosphorus levels.

Liver Function
When the liver is sick or damaged, many of the enzymes that are normally inside cells are released into the bloodstream. Measurement of liver enzymes in blood can help a veterinarian determine the source and type of liver disease or blockage. These enzymes are: ALT, AST and ALP. The liver is involved in making bile. Bilirubin is the orange/yellow pigment in bile. Liver disease results in the release of large amounts of bilirubin into the bloodstream. This can result in jaundice.

Products made by a healthy liver, and therefore found in abnormally low levels if the liver is not functioning well include urea (BUN), cholesterol, albumin, globulins and glucose.

Pancreas Function
The pancreas gland releases hormones as well as some digestive enzymes. Pancreatitis may be indicated by the presence of pancreatic enzymes such as lipase and amylase in the bloodstream. Blood levels of these enzymes can be several times their normal level in patients with pancreatitis. Amylase can also be elevated during kidney diseases because kidneys are responsible for secreting amylase.

Thyroid Function
T4 (thyroxin), one of the hormones produced by the thyroid gland is usually present in diminished amounts in the blood of dogs with hypothyroidism (underactive thyroid glands). TSH (thyroid stimulating hormone) is produced by the pituitary gland and is elevated in the blood of most dogs with hypothyroidism.

Urinalysis - Worth Its Weight in Gold!

Yankee Golden Retriever Rescue

The next time you take your dog for a walk, think of it as a mini health screening. You can get an early warning of medical maladies, veterinarians say, by looking at your dog's urine and watching the way he voids. Find an area of white sand (or snow) -- that way you can see the urine.

An abnormal colour might indicate a problem. Red urine often means blood and possible infection. Orange urine could signal bilirubin, a component of bile secreted by the liver into the intestinal tract; high levels can lead to jaundice and reveal problems in the liver and bile duct.
If your dog strains to pass urine, he might have some kind of blockage -- perhaps even a tumor. If he frequently voids small amounts of urine or urinates in unusual places, he may have a urinary tract infection. Schedule a vet visit right away.

Even without abnormal colour, a complete urinalysis as part of a dog's regular check up provides information about the health of several organ systems, including the urinary tract. Information from urinalysis can be obtained in a matter of minutes, while blood work results usually take a day or more.

There are many insights to be gained from urinalysis that cannot be gleaned from blood work alone, and when blood and urine test results are obtained simultaneously, each becomes more valuable.

A complete urinalysis should look at specific gravity, color, sediment, turbidity (cloudiness when sediment is stirred), odor, pH, any abnormal amount of protein and possible glucose, bilirubin and blood.

Measuring specific gravity (USG) determines whether urine is concentrated or dilute. Normally, the kidneys maintain hydration by preserving fluid during filtration, resulting in concentrated urine. If the kidneys aren't working well, fluid loss results in more dilute urine. For evaluating kidney function, measuring USG is imperative. Clinical symptoms of kidney disease often don't emerge until 75 percent of the kidney's function is lost. In the early stages, the only sign of kidney disease is that of an abnormally dilute urine in the presence of normal blood analysis. Other systemic diseases such as diabetes insipidus, Cushing's or Addison's disease, can lead to dilute urine when there is no kidney disease.

The dipstick (the "dip"), which is rapid and simple to perform, measures various urine components. Small drops of urine are placed on a plastic strip lined with a series of colored indicator squares. Changes in color reveal acidity or pH, the presence of blood cells, glucose, ketones, bilirubin, protein and other components. Red blood cells could indicate a bladder or kidney infection. The presence of bilirubin points toward liver disease. Elevated protein levels may indicate a kidney disorder.

The urine sediment is examined as the last part of the urinalysis. A small amount of urine is spun to settle out any solid particles. What's left in the bottom of the tube is viewed under a microscope. Normal urine has little or no sediment, but abnormal urine may contain crystals, red blood cells, white blood cells, bacteria, cancer cells, kidney cells and other clues to problems along the urinary tract.

The value of urinalysis is clear, and it is never a waste of money. Even normal urinalysis results yield valuable information about what diseases are not present.

Ear Problems and Care

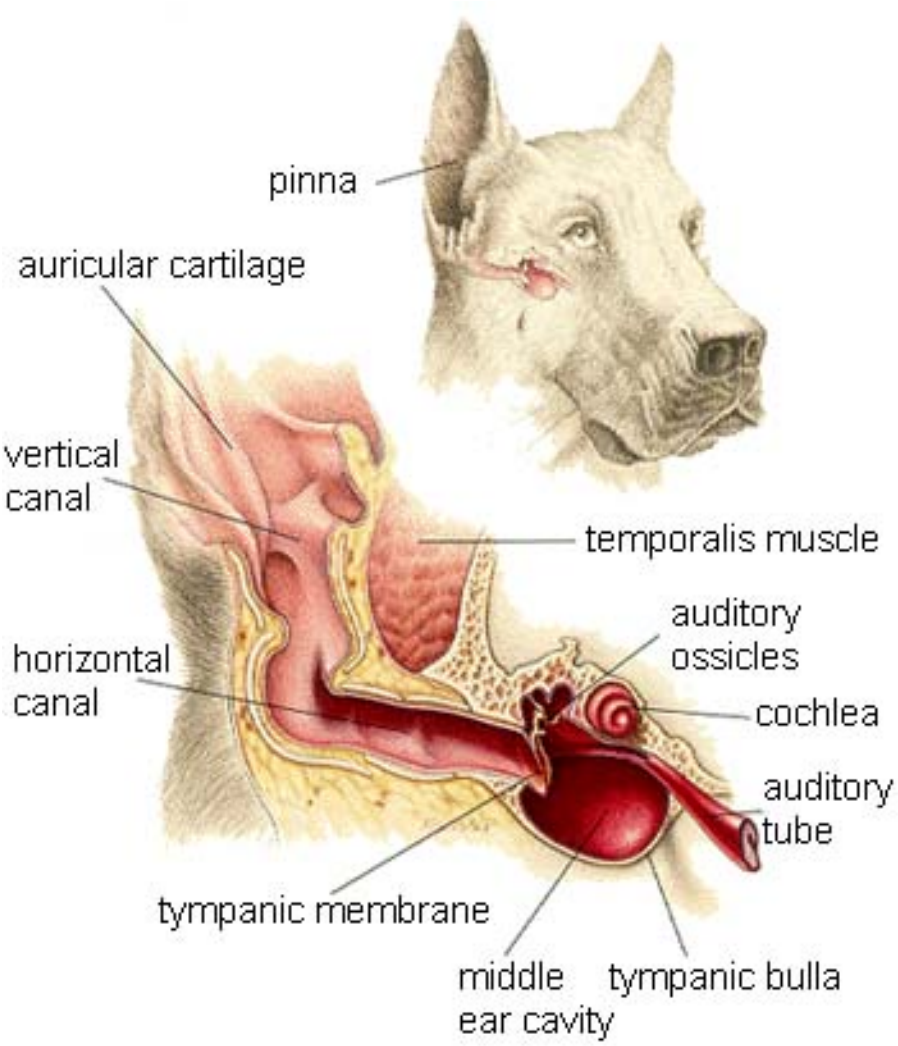
A dog's sense of hearing is acute, many times greater than our own. A dog's ears are delicate, sensitive, finely tuned instruments that allow the dog to pick up sounds that humans could never hear. That's why ear care is so important.

About the Dog's Ear

The ear has three parts: the pinna, or auricle, the middle ear and the inner ear. The pinna is a flap that forms the outer section of the ear. It originates the hearing process by trapping sound waves. The pinna also determines the ears' shape and movement.

The middle ear, which processes sound, consists of the tympanic cavity, the eardrum and the auditory ossicles, a series of tiny bones known as the hammer (malleus), anvil (incus) and stirrup (stapes). Sound waves travel down the ear canal to the eardrum, where they are transmitted across the middle ear by the auditory ossicies to the inner ear.

Small fluid-filled tubes, or canals, make up part of the inner ear. Tiny hairs inside the tubes record movement of the fluid and changes in the dog's posture and position. This information, when passed along the auditory nerve to the brain, governs the dog's sense of balance. The rest of the inner ear consists of the cochlea, a snail-shaped tube that converts sound vibrations into messages, and the auditory nerve, which carries the messages to the brain, where they are translated into meaningful sounds.



Ear Problems

Ear infections are common in dogs, and dogs with heavy, hairy, hanging ears have them the most often. The canine ear canal is very long and makes a right angle turn into the ear drum. Dogs with floppy ears have ear canals that are shut off from air and can stay moist and warm: an ideal environment for bacterial growth. Untreated ear infections can develop into chronic conditions which are very painful to the dog and may cause deafness. In some cases, surgery will be required to try to rectify the problem.

Detection

How can you tell if your dog's ears are healthy? Take a look -- make a visual inspection of each ear - inside and out. A healthy ear should be free of debris, dirt or excess wax, with no sores or inflammation. Another way to check is to smell your dog's ears. It may sound strange, but ears with problems often emit a strong odor; healthy ears do not. An ear with an unpleasant odor is an ear that needs attention. Touch your dog's ears. Are they extremely warm to the touch or sensitive? Ear infections can be painful, so if your dog whimpers when you touch its ears, there may be a problem.

Otitis - Inflammation

Dogs can suffer from three types of ear infections: otitis external (infection of the ear canal); otitis media (infection of the middle ear), and otitis internal (infection of the inner ear). The most common signs of an outer-ear infection are a waxy or pus-like discharge, often accompanied by a foul odor; redness and irritation; frequent scratching at the ear and shaking of the head; and rubbing the ear along the floor.

Middle-ear infections are not common. They are usually the result of an untreated outer-ear infection, a punctured eardrum or an infection entering from the eustachian tube. Middle ear infections are painful, and a dog may hold its head to the side or shy away when its ear is touched. Because middle-ear infections can affect a dog's balance and hearing, treatment should not be delayed.

Inner-ear infections often occur when middle-ear infections spread to the inner-ear. The signs are similar to those of outer- and middle-ear infections. Again, because inner-ear infections can cause temporary or even permanent deafness, treatment should begin at once.

Ear infections are most frequently caused by bacteria, fungus, ear mites or a combination of these. The type of treatment depends on the cause of infection.

Treatment

Generally, treatment includes cleansing the ear with a special solution formulated to break down the wax and discharge, followed by medication to kill the mites, bacteria or fungus. In severe or chronic infections, the veterinarian may culture the ear to determine more accurately the cause of infection and the best medication.

Prevention

Examine and clean your dog's ear canal weekly. Healthy ears don't need much cleaning. Wipe your dog's ears out with a dry cotton ball or one slightly moistened with mineral oil each time you groom. (DO NOT USE Q TIPS!!) You can also use commercially prepared ear cleaners, though it's probably not necessary if the ears are clean. (Most of these products can contain alcohol, which some vets say irritates the ear lining and which can feel cold going in.

Cleaning a dirty ear, one that is filled with wax or dark brown waxy debris (a sign of ear mites) is another story as many dogs do not like this activity. Dampen a cotton ball with mineral oil or ear cleaner and get to work. Hold the ear flap up with one hand and wipe it with the other. Wrap another dampened cotton ball around your finger and insert it gently into the canal as far as you can. Do not poke! Wipe out all the folds and crevices, but wipe gently. You may need to use

several cotton balls to properly clean the ears.

If the ear is extremely dirty or filled with dry, caked debris, you may want to fill the canal with ear cleaner(per directions from your vet) before wiping it out with cotton balls. To do so, hold up the ear flap with one hand and with your other, squirt a small amount into the canal. (Many dogs will resist this. Try to bring the cleanser to room temperature beforehand to make the solution less shocking.) Massage the base of the ear for a few minutes, let the dog shake his head and then clean the ear with cotton balls.

PostScript
Some literature suggests that chronic ear infections may be caused by hypothyroidism. If your dog suffers from skin problems and ear infections, have him tested for thyroid insufficiency.

The Digestive Tracts of Carnivores vs Herbivores

With all the emphasis on eating over the holidays, I read with fascination this article comparing the digestive systems of carnivores and herbivores. See if you don't find it as interesting as I did!

There are basically two types of animals in nature, herbivores and carnivores. Herbivores are animals that eat vegetation. They are able to digest and use as food the cellulose which forms the cell walls of all plants. Carnivores are animals that eat herbivores. Unlike herbivores, the carnivore's digestion is unable break down vegetable cell walls.

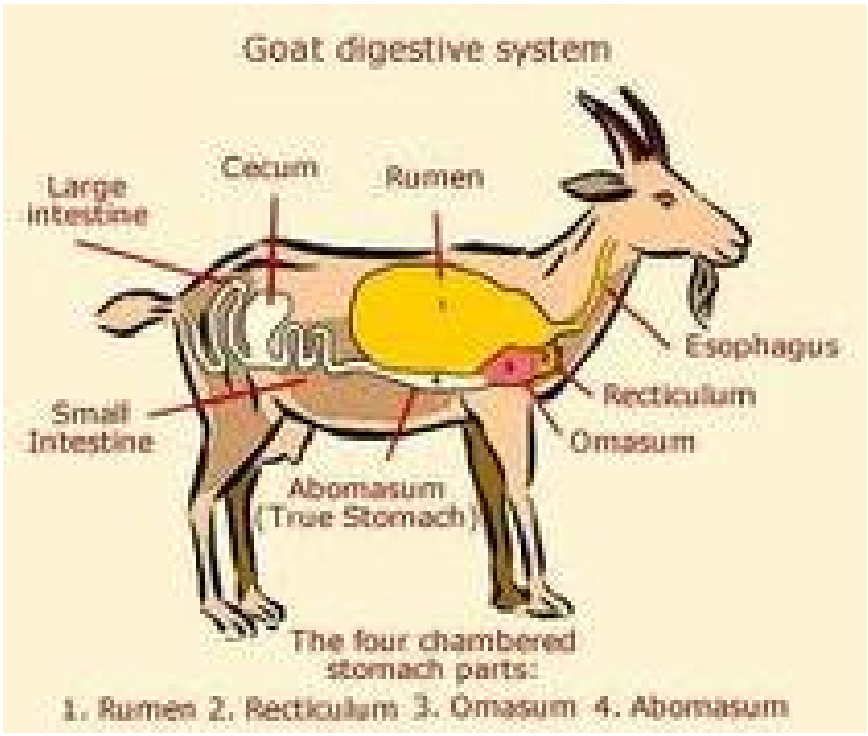
The Gut of a Herbivore - Sheep and Goats

While all carnivores' digestive tracts are similar, herbivores' digestive systems vary widely. There are two basic types of herbivore: those with simple stomachs (e.g., horses, rabbits, gorillas), and those with complex stomachs (e.g., cows, goats, camels, and sheep). The latter type are called *ruminants* because they 'ruminate' or chew a cud as part of their digestive process. A ruminant's stomach is complex, having four chambers. Let's take a closer look at a familiar herbivore, the sheep.

As we all know, a sheep is a herbivore that eats grass. A woolly ball on legs on the outside, a sheep's inside is unbelievably complicated. The total length of the sheep's digestive tract is about twenty-seven times as long as the animal's body length. (In case you were interested, this dimension is common to all herbivores).

The first major difference between the herbivore and the carnivore is the sheer amount of food the herbivore is forced to eat. While a carnivore can usually manage with one small meal a day, the herbivore must eat so much that it is continually eating and its stomach is never empty.

The mouth. A sheep has no incisors or canine teeth in its upper jaw. It doesn't bite grass off; it tears it off. The sheep's molars are flat and its jaw movements are rotary, designed for grinding rather than for crushing or tearing. The sheep's salivary glands are also very important as they produce the prodigious amounts of saliva necessary to fully permeate the food during rumination. While chewing is of little importance to carnivores such as the dog (I can testify to that - did they even taste their food as they gulped it down?), it is vital to the sheep.



The rumen. As a sheep grazes, the grass passes straight into the first chamber of the stomach, the *rumen* . This has a capacity of some four gallons. When the rumen is full, and the sheep has an opportunity, it regurgitates small parcels or 'cuds' of food back to its mouth for chewing and further mixing with saliva. The saliva of a sheep does not contain amylase necessary for digesting starch, so this 'chewing the cud' is merely to aerate, macerate and mix the saliva more thoroughly to aid digestion of the grass.

In addition, the rumen does not contains any digestive juices but it does contain billions of bacteria and protozoa which begin the process of breaking down the cellulose cell walls into *cellobiose* to begin the process of releasing the nutrients inside. This is a process entirely miss-

ing from the digestive system of a carnivore.

Some carbohydrates are converted to fatty acids and others are absorbed by bacteria and other micro-organisms to be converted into other substances. About seventy percent of the cellulose is absorbed directly into the bloodstream from the rumen.

The reticulum. The next chamber after the rumen is the much smaller *reticulum*, with a capacity of about four pints. It is here that small parcels of food are compacted into cuds for regurgitation to the mouth for rumination. These then return to the rumen for more bacterial breakdown.

The omasum. In time, the contents of the rumen and reticulum pass to the third chamber, the *omasum* . This holds about a gallon of material. Again, the food is subjected to attack and breakdown by bacteria and other micro-organisms. Note that although we are three-quarters through the stomachs of the sheep, we have yet to encounter any digestive enzymes. All these chambers are solely concerned with the breakdown and liquefaction of the food into such a form that it can be digested when it is eventually subjected to such enzymes.

The obomasum. The fourth and last chamber of the sheep's stomach, the *obomasum*, which holds about two gallons, is the sheep's true stomach. The obomasum has glands which secrete hydrochloric acid, pepsin and a weak fat-splitting enzyme called lipase. All of these enzymes are much weaker in concentration that in the dog's digestive system. These enzymes break down the plant proteins and fats and, much more importantly, they kill and absorb the billions of bacteria and other micro-organisms that have done all the work so far. In this way plant protein is transformed into animal protein within the herbivorous digestive tract, making it possible for herbivores to survive without even traces of animal protein in their diet.

Intestine. From here on, digestion takes place much as it does in the dog. The difference is the bacterial breakdown of the plant cell walls by the first three chambers of the sheep's stomach, which has no parallel in the carnivorous dog.

The sheep's digestive system is very wasteful, unlike that of the dog, over fifty percent of the food eaten is excreted.

The Gut of a Carnivore — the Dog

The first thing to note about the digestive system of all carnivores is that they are remarkably similar and they all function in exactly the same way. Although they will be of different lengths, because carnivorous animals come in different sizes, the overall length of carnivores' digestive tracts are rather short: about six times the length of the animal's body.

The gut of any animal is usually measured after death when its muscles are relaxed. This gives a quite wrong impression. While dissections of dead dogs have measured their digestive tracts at over thirty feet, this is not its normal length when the animal is alive. It has been found by passing a rubber tube through a living dog, which has a similar gut length when dissected, that the front end appears at its anus when little more that ten feet has entered the mouth. From measurements such as these it is generally reckoned that the total length of a carnivore's gut is probably about five to six times the length of the animal's body.

Digestion of food in a carnivore is performed by enzymes produced by glands in the animal's own body and all the absorption of nutrients in that food is through the wall of the small intestine. This is quite different from the digestion of a herbivore. Using the example of a dog, a pure carnivore, let us traverse the digestive tract from one end to the other to discover what each part does.

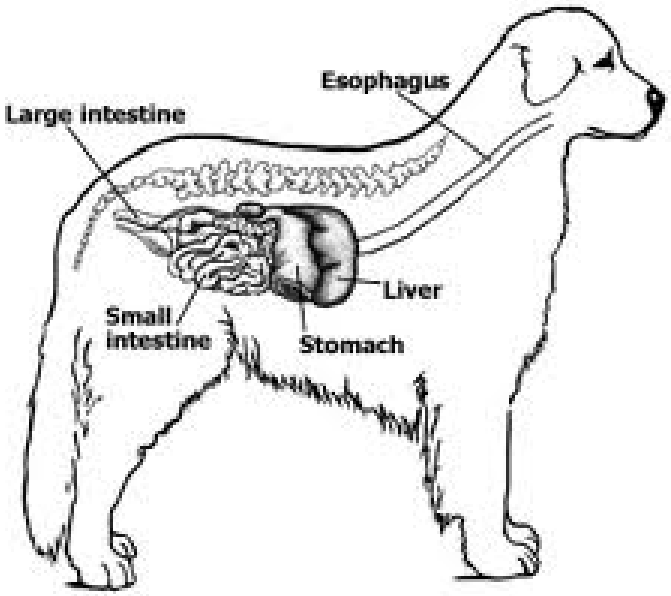
Mouth. The dog's jaw contains incisors, canines and molar teeth in both jaws, and the molars are ridged. The jaw moves up and down. This fact, together with the ridging of the molars indicates that they are used for tearing or crushing. The salivary glands serve merely to lubricate, and do not have an important digestive function. Food is rarely chewed into small portions, but 'wolfed' down whole.

Stomach. The dog's stomach, the only bulge in the digestive 'pipe', is small, holding about four pints. Its small size gives a good estimation of the amount of food the animal can consume at any one time.

The stomach serves two purposes. Firstly it is a reservoir. Although relatively small, this is all that is needed, as the food of a carnivore, wholly of meat and fat, is nutrient dense, allowing one small meal to suffice for many hours. The second function of the stomach is to subject the food to concentrated solution of hydrochloric acid, which dissolves and liquefies it. Only food that is dissolved can be digested. Different foods dissolve at different rates and leave the stomach at different rates. The ones that cannot be digested - raw vegetable matter, cellulose and bone - pass right through the animal unchanged and those that are too big to pass into the small intestine are vomited.

The dog's stomach, if filled with its normal food of meat and fat will empty in about three hours and the stomach then rests until the next meal is eaten. So far very little digestion has taken place and, in the carnivore, the stomach is not an essential organ from the point of view of digestion.

The small intestine. The small intestine, approximately twenty feet in length in a dog, is vitally important. Without it, no digestion could take place and the animal could not survive. The dissolved food, called 'chyme' at this stage, leaves the stomach in a series of spurts, controlled by a valve, the pylorus, and enters the small intestine. It is in the small intestine that food is actually digested and enters the bloodstream.



After a few inches, two ducts connect from the pancreas and the liver to the small intestine. These two organs supply and deliver the enzymes needed to break down the fats and proteins into their component fatty acids and amino acids. Only in this form can they pass through the gut wall into the bloodstream. These enzymes are vitally important to the carnivore. Those from the pancreas immediately start to break down the chyme into its basic components and continue to do this throughout the chyme's passage along the small intestine.

Although the chyme is a watery mixture, it typically has a high fat cntent. As fat will not mix with water, it requires some special handling. This is where bile comes in. Bile acts just like a detergent in that it emulsifies the fat to make it soluble in water. This action makes fat susceptible to digestion by the digestive enzymes. Bile is manufactured continuously by the liver and is stored in the gall bladder to be saved and concentrated until it is needed (for the next meal). When fat is detected in the small intestine, this triggers the release of the stored bile, which enters the intestine through the bile duct.

As there is no enzyme in the carnivore capable of digesting cellulose, the material that the cell walls of all plants are composed, little or no digestion of carbohydrates can take place.

By the time the chyme has passed through the animal's small intestine, the process of digestion and absorption of the nutrients in the food is complete. The large intestine, or *colon* , has just one function to perform. It would be wasteful to allow water to escape and so the colon extracts the water and compacts the rest of the waste material from what is left of the chyme into a small compact mass, where it is stored in the rectum until it is finally expelled through the anus. The colon in a carnivore is not essential, merely a convenience.

The caecum. The small intestine doesn't join the large intestine in a straight line, but at a right angle. At this point is a small appendage, two or three inches in length, called the caecum. This has no functional use in a carnivore and is one of the major differences between a carnivore and a herbivore.

The gut flora. Practically the whole of the gastrointestinal tract of a carnivore is sterile. The hydrochloric acid in the stomach ensures that most bacteria and other micro-organisms in swallowed food are killed. Those that escape the stomach are rarely able to survive the digestive processes - they are, after all, made of protein. The colon is the exception. This, where no further digestive processes occur, does tend to harbour a variety of organisms which form certain vitamins such as pyridoxine, vitamin B-12, biotin, vitamin K and folic acid but, as these are not absorbed through the wall of the colon, they are of little account. These micro-organisms thrive in an alkaline environment and are of the putrefactive type.

The digestion of protein and fat, with little or no carbohydrate, in the carnivore's gut is remarkably efficient. Experiments which have measured the amounts of various nutrients eaten and compared these with the amounts passed in the animal's excreta have shown that a healthy animal loses no more than four percent of its fat intake and only a trace of the protein.

A Last Look - the Gut of a Human

A brief look at the human's digestive system shows that it is remarkably similar to that of the dog in form, digestive enzymes and length. The only significant difference is that our saliva contains amylase, an enzyme that is used to digest starch. However, in common with all carnivores, we have no digestive enzyme that will break down a plant's cell walls to release that starch. Unlike the sheep, we also do not possess in our guts bacteria or other micro-organisms to do the job.

If we eat a largely plant-based diet, the bacteria in our colons will change the environment in our colons from alkaline to acid, which favours the herbivore-type fermentative bacteria. These will break down plant material but, as no absorption of nutrients these contain takes place in the human colon, this is of no nutritional value. All it does is upset our guts and cause flatulence!

The Five Supplements Every Dog Needs

Douglas Knueven, D.V.M.

No matter what you feed your golden—be it a kibble-based diet, or a raw-food diet—most studies support the addition of certain supplements. This article outlines the top five supplements that all dogs need, in order of importance.

A Balanced Multivitamin/Mineral

Vitamins and minerals are nutrients the body needs to function properly and cannot manufacture on its own. Even in "complete" commercial diets, nutritional deficiencies have been found. Further, the vitamin and mineral content of pet diets is based on "average" animals. Stresses, such as surgery or illness, and athletic performance, such as field or agility, cause a need for extra nutrition. Additionally, the nutrition in pet foods is linked to calories. For example, if the food bag says that, based on his weight, a particular dog needs 3 cups of food, then that is what he needs to get the required vitamins and minerals. If the dog gains too much weight on this quantity of food (a very common situation) and the owner cuts the amount fed, then the animal's diet will likely be more deficient. For these reasons it is recommended that all pets get a good multi-vitamin/ mineral supplement, preferably one made from concentrating the nutrition in whole foods versus a synthetic chemical source.

Essential Fatty Acids (EFAs)

A number of recent studies has led canine nutritionists to conclude that all dogs need EFAs, most commonly acquired through fish oil added to their diets. Nutritionists contend that fish oil can have a profound impact on key areas of the body, on cancer, on cognitive function as well as other additional health benefits such as allergies and joint health.

Cancer is the leading cause of death in older cats and dogs. One of the most important areas of research involving the fatty acids found in fish oil is how their supplementation can aid with cancer. According to recent research, adding fi sh oil to the diet increases the survival time of cancer patients by 30% to 50%. It also causes longer periods of remission for cancer patients undergoing chemotherapy, and it counteracts the metabolic changes that cancer can cause, such as the characteristic wasting. The study concludes that "The omega-3 fatty acids found in fish oil are probably the most important nutrients to consider for dogs with cancer."

In 2004, the Iams Company released a study that explored the effect of dietary fish oil on canine intelligence. The theory was that since 5% of the brain is composed of DHA (one of the essential fatty acids found in fish oil), this could be an important nutrient. This study focussed on the developing brain. For this research, pregnant dogs and (after whelping) their puppies were divided into two groups. The study group was supplemented with fish oil, while the control group was not. At nine weeks of age, the offspring were started on a one-month training/testing period designed to gauge the individual's intelligence. Incredibly, the training performance index for the fish-oil group was double that of the control group. This led the researchers to conclude, "When you consider that the number one killer of dogs is euthanasia due to behaviour problems, we should be recommending high-DHA diets." Research in people, which may translate to pets, also shows that high dietary intake of fish oil can help with depression and Alzheimer's disease, and can reduce the risk of strokes caused by blood clots. Omega-3s have even been shown to improve schizophrenia and attention deficit/ hyperactivity disorders.

The skin is the largest organ of the body and in dogs it is the usual place where allergies manifest. Allergies are simply a manifestation of inflammation and are promoted by an inflammatory system that is out of balance. Recent research has shown that 45% of dogs with inhalant allergies had a good to excellent response to simply changing the diet to one with an Omega-6 to Omega-3 ratio of five-to-one.

Another important area of the body influenced by the dietary imbalance of EFAs is the joints. Many of our dogs suffer from arthritis and this problem seems to be affecting younger and younger canines. Arthritis is merely an inflammation of the joints. This condition can be predisposed by many factors such as conformation—as is the case with hip dysplasia, or trauma. But, research indicates that the lack of dietary Omega-3 fatty acids plays a role as well. Studies have shown that adding fish oil to the diet can reduce the stiffness, pain, and inflammation associated with this debilitating disease.

Because of the recent research on EFAs, some pet food companies are supplementing certain select diets with fish oil. This is a step in the right direction. The effectiveness of this new development is questionable though because due to their chemical structure, EFAs are inherently unstable and reactive. This means that they easily oxidize (go rancid). In fact, EFAs are rendered useless by exposure to heat, light, and air. So, even if there are plenty of EFAs in the food to begin with, and it withstands processing and sitting around on the store shelf, as soon as you open the bag and expose the food to air, the EFAs begin to deactivate. For this reason, it is recommended that dogs be supplemented with fish oil that can be properly stored and applied to the food, fresh with each meal. It is important to carefully research any fish oil supplement to see how it is harvested, packaged, preserved, and tested. To maintain the integrity of the EFAs the oil must be processed with as little exposure to heat, air, and light as possible. Also, because fish can be a source of mercury and other toxins, it is imperative that the fish used come from unpolluted waters and that testing is done on the oil to ensure purity. Do be cautious regarding cod liver oil. Although this form of fish oil is a rich source of the same Omega-3 EFAs as found in fish oil, it also can contain high levels of vitamin D, depending on the brand, and it is possible to create toxicity by over supplementing this nutrient. For this reason, stick with other fish oils.

There are two rare problems associated with supplementing fish oil, especially at the higher doses. If your pet is prone to pancreatitis (a disease that causes the pancreas to over-respond to dietary fat), then adding fish oil to the diet could aggravate the condition. The other problem that occasionally happens is that the extra oils in the diet can cause diarrhea. To minimize these problems, if your pet has a tendency toward GI troubles, then it is best to start at a low dose and gradually work your dog up to the desired level.

Probiotics

The canine intestine is teaming with bacteria. In fact there are many more bacteria in the intestine than there are cells in the body! Some of the intestinal microbes can cause disease. Others, called probiotic bacteria, are actually beneficial because they keep disease-causing germs under control and help to release more nutrients from what's left of the food. An imbalance in the intestinal flora can lead to diarrhea and nutritional deficiencies. The good bacteria in the intestine can be thrown off by medications (especially antibiotics), dietary irregularities, and stress. If your pet gets diarrhea while on antibiotics it is usually because of this effect. In the wild, wolves commonly eat their own stool to rebalance their gut bacteria, and this is sometimes the reason our pets resort to coprophagia. Probiotics are supplements that help to replenish the good bacteria in the intestine. Most pets do not need to be kept on probiotic supplements continuously but all dogs need a balancing dose from time to time. It is a good practice to give probiotics at the change of seasons and during and after treating the pet with any medication.

Glucosamine/Chondroitin

Glucosamine and chondroitin are components of healthy joints. They help the joint cartilage maintain its 65% to 80% water content. This gives the joint its shock absorbing quality like a wet sponge. Joint cartilage lacking these substances becomes like a dry sponge and develops arthritis. Throughout an animal's life, there are two competing processes going on in joint cartilage. On the one hand, there are cells that continuously break down joint tissue. At the same time, there are cells that rebuild the tissue. This is how the body refurbishes itself. If the raw ingredients for rebuilding, such as glucosamine and chondroitin, are lacking, then the rebuilding process cannot keep up with the destructive process and the joint degenerates.

Glucosamine and chondroitin support joint health and they not only aid with arthritis, studies show they help prevent arthritis from developing in the first place. That's why all dogs can benefit from these nutrients—especially performance dogs whose joints take much wear and tear. Non-steroidal anti-inflammatory drugs decrease inflammation and pain but also inhibit the cartilage reconstruction process and thereby worsen the condition they are used to treat.

Digestive Enzymes

Digestive enzymes are chemicals made by the pancreas and excreted into the intestine to further break down food particles so they can be absorbed into the bloodstream. Ample enzymes are essential for the body to absorb all the nutrients from food. Even healthy animals need extra digestive enzymes. A closer look at enzymes reveals that every living cell contains enzymes that help it function. When an organism dies, the cell enzymes are released and begin a self-digestion action called autolysis. So food, whether plant or animal, begins the digestion process on its own. Unfortunately, heat

destroys the cellular enzymes so cooked and processed foods require extra digestive enzymes on the part of the consumer. Also, it has been shown that animals are able to produce fewer and fewer digestive enzymes as they age. This can be a major cause of the wasting seen in elderly pets. Besides, extra enzymes increase the absorption of many nutrients. In fact, essential fatty acids, like the ones in fish oil, have a 71% increase in assimilation when digestive enzymes are taken concurrently.

So there you have the listing of supplements that your dog needs. Talk to your veterinarian or canine health care professional about recommended brands. One of the unfortunate pitfalls about purchasing supplements is the issue of reliability. Because there is little federal oversight of nutritional supplements, you cannot be sure that you are getting what the label says. For example, a study published in June 2000, showed that only 6 out of 24 store-bought glucosamine supplements met label claims—some contained as little as 25% of what the label said. The same study showed that 26 out of 32 health food store chondroitin supplements had less than 90% of label claims and that 14 of them had less than 10%. Standards for supplements do not match those for medications and you cannot trust the labels. If you buy the bargain brand you are probably wasting your money so speak to someone with experience in this area before purchasing.

Dr. Doug Knueven received his veterinary degree from Ohio State University in 1987 and practices in Beaver, Pennsylvania. Certified in veterinary acupuncture, animal chiropractic, and veterinary Chinese herbology, Dr. Knueven offers workshops on various aspects of holistic pet care and authored the book Stand by Me, A Holistic Handbook for Animals, Their People and the Lives They Share Together.

Ticks: An Increasing Concern for the Traveling Golden

Vector-borne diseases - diseases that are carried by an insect or arthropod (such as a tick) - are becoming of increasing concern to goldens and their owners. Most of these diseases - whether bacterial, protozoal and in some instances viral pathogens - are intracellular, meaning that they reside inside of cells in the animals that they infect. A single tick bite may transmit multiple species and dogs may be multiply-infected as a result. Unfortunately, infection does not confer lasting immunity and dogs can easily become re-infected.

Some of the tick-borne diseases infecting dogs in North America can include:

Genus	**Ehrlichia**	**Babesia**	**Rickettsia**	**Borrelia**	**Neorickettsia**
Species known to infect dog	E. canis E. platys E. chaffeensis E. ewingii Anaplasma phagocytophila (formerly E. equi)	B. canis B. gibsoni plus one or more as yet unnamed species of "small" Babesia	R. rickettsii	B. burgdorferi	N. helminthoeca N. (Ehrlichia) risticii
Causes this disease	Ehrlichiosis Anaplasmosis	Babesiosis	Rocky Mountain Spotted Fever	Lyme Disease	N. helminthoeca ... -- Salmon poisoning N. risticii -- causes Potomac Horse Fever; in dogs illness is similar to ehrlichiosis

A shocking percentage of ticks are infected with agents that cause diseases in dogs and their owners. In a study in New Jersey, 33.5% of ticks were infected with Borrelia burgdorferi (Lyme disease) and 34.5% were infected with Bartonella spp (Adelson et al., 2004). In a previous study, 49.3% of adult Ixodes scapularis (deer) ticks from New Jersey were infected with Borrelia burgdorferi (Schulze et al., 2003). In a survey of ticks from New Jersey, New York, Rhode Island and Connecticut; 25% of adult ticks and 20.7% of nymphal ticks were infected with Borrelia burgdorferi, and the average number of Borrelia organisms per tick was 5,351 and 1,964 for adult and nymphal ticks respectively (Wang et al., 2003).

Symptoms

For whatever reason, perhaps their ability to hide within the hosts cells, these organisms have profound effects on the immune systems of their host. Autoimmune reactions are the hallmark of tick-borne disease. There may be autoimmune destruction of blood cells or blood cell progenitors in the bone marrow. Joints are inflamed and swollen and fluid tapped from affected joints has all the characteristics of autoimmune poly arthritis. Affected dogs may suffer from autoimmune disorders such as inflammatory bowel syndrome, myositis, and uveitis. Many affected dogs are reported to suffer from skin "allergies", another indication of immune system dysfunction. In addition, these organisms often appear to suppress the hosts immune system at the same time they are triggering autoimmune reactions. Immune system depression manifests as lack of antibodies and vulnerability of the infected animal to secondary infections.

Infections often go through three stages: acute, sub-clinical, and chronic. The acute stage of occurs within a few weeks of infection. Dogs may appear to be suffering from “flu,” exhibiting low energy, lack of appetite, fever, swollen lymph nodes, and even nasal discharge. Other manifestations may include, but are not limited to: low platelet count, slight anemia, swollen lymph nodes, photosensitive eyes, discharge from the eyes, cough, lameness, joint pain and swelling, recur-

rent diarrhea, vomiting bile, unexplained weight loss and/or loss of muscle mass, and increased water consumption. Neurological symptoms may also be seen, including (but not limited to) seizures.

While most infected dogs will have more than one, but not all of these signs of infection, some acute stage symptoms may be so mild that symptoms are not recognizable. Following the acute stage of infection, untreated dogs may enter a sub-clinical stage. In this stage the dog is asymptomatic and appears healthy. The sub-clinical stage can last for weeks or years. If a dog has a strong immune system, it may be able to keep the organisms in check, thus maintaining a sub-clinical state for quite a long time. Eventually the dog may experience stress that weakens the immune system enough that the infection becomes active again, and the dog enters a chronic stage of infection.

In chronic stage infections, the organism may penetrate brain and central nervous system tissues, internal organs (liver, spleen, kidneys), reproductive organs (uterus or testes) and bone marrow. A tremendous number of symptoms are possible, making accurate diagnosis difficult. Symptoms and signs are serious and may be life-threatening including: severe anemia, low platelets (thrombocytopenia), low white cells, bone marrow failure, muscle wasting / weight loss, kidney failure, liver failure, enlarged spleen and/or liver, cardiac damage, autoimmune disorders, abnormal thyroid function, seizures & other neurological disorders, meningitis-like illness, uveitis, severe non-regenerative anemia and thrombocytopenia (i.e. low platelets), seizures, muscle wasting, kidney failure, enlargement of the spleen, cardiac abnormalities, and bone marrow hypoplasia.

Tick-borne infections are commonly misdiagnosed, often as lupus, lymphosarcoma, leukemia, autoimmune hemolytic anemia, epilepsy, myositis, brucellosis, inflammatory bowel disease, encephalitis and “autoimmune disease.”

Testing

There are two major types of tests available for tick-borne diseases: indirect tests such IFA titer, ELISA and Western blot tests look for the presence of antibodies against a particular organism whereas direct tests such as PCR testing look for direct evidence of the presence of the organism itself.

Indirect antibody tests are most commonly used as they are more easily available from commercial testing laboratories and are less expensive. These tests analyze for the presence of antibodies against specific organisms. High levels of antibodies are believed to indicate active infection. The problem is how to interpret negative or low level positive results. A negative result is generally interpreted to mean the dog is not infected, although it could also mean the dog's body simply has mounted no immune defense against the infecting organism. Low levels of antibodies may indicate a poor immune response against an active infection, or past exposure to the organism but no active infection.

Since antibodies may persist in the bloodstream for months or years following an infection, the presence of antibodies is not unequivocal evidence of active infection. The tick-borne organisms are notorious for causing immunosuppression and there is anecdotal evidence that infected dogs may have low or zero antibody levels. Low antibody levels or negative antibody test results are not conclusive evidence for lack of infection.

One probable reason for negative test results for dogs whose symptoms strongly suggest tick-borne disease is that the dog was not tested for the right species. Antibody tests are very specific for the exact species of tick-borne organism. Only a few species create "cross-over" problems, where antibodies from one species cause a false positive reading when testing for a different species. Typical test "panels" only test for a few species of the many tick-borne organisms that may infect dogs.

IFA (indirect fluorescence assay) titers are the most reliable type of titer test to run for tick-borne diseases. IFA tests analyze for the presence of antibodies. Results are reported as a ratio, indicating how far the sample could be diluted and still have a positive reading for the presence of antibodies. The higher the ratio, the greater the abundance of antibody in the dog's blood. Tests are specific for the exact species. IFA tests are available for almost all species of tick-borne organisms that infect dogs, and are available from a great many commercial laboratories. As with all testing, it is important to use a reputable laboratory that uses careful lab procedures and quality control.

Veterinarians now have available to them a simple in-house test kit (known as the SNAP 4Dx that tests for Borrelia burgdorferi (Lyme Disease), antibodies to Ehrlichia canis, exposure to Anaplasma phagocytophilum, and canine heartworm, all in the same test kit. These test use the ELISA antibody testing method. They are fast and inexpensive, but not 100% reliable given that a positive reading on the SNAP test should be considered accurate but a negative reading does not necessarily mean the dog is free of those infections. There is also some question as to whether the SNAP 4Dx test can distinguish between Borrelia antibodies caused by infection versus those produced by the Lyme Disease vaccine. For that determination a Western Blot test must be run.

Direct testing methods inclide an examination of blood smear slides by microscope to look for visible intracellular evidence of tick-borne organisms. Ehrlichia and Babesia can sometimes be detected in this manner. The problem is even at the height of active infection, the actual numbers of organisms in the infected animal are low. Sometimes several slides need to be examined in order to find just one organism. The absence of organisms on a blood smear is not proof for lack of infection.

PCR testing is a method that can detect the presence of DNA from a specific species of infecting organism. One advantage of PCR testing is that it can be done on tissues other than blood samples, enabling one to test for organisms that have left the blood stream and may be sequestered in other body tissues. The PCR method extracts DNA from the sample, adds it to a "primer" that binds DNA that matches specific DNA sequences for the exact species of organism being tested for. This is then amplified to detectable levels and tested to verify the match to the species of interest. The method can detect extremely small quantities of DNA. PCR testing is very specific to the exact species and are available for most but not all species of tick-borne organisms known to infect dogs. However, PCR tests are not widely available from commercial laboratories. A number of research laboratories have developed PCR tests for tick-borne organisms and will run samples submitted from private veterinary clinics.

PCR tests can produce false positive test results. Only a tiny bit of contamination of the sample can yield a false positive, hence the need for high quality lab work. PCR can not distinguish between DNA from a dead organism versus a living one, therefore dogs who have been recently treated and still have dead organisms in their bodies, may get positive test results even when treatment was successful. Follow-up PCR testing done after treatment should be delayed until 6-8 weeks following the end of treatment. PCR testing can yield false negative results also. The tests are so species-specific, one must test for exactly the right organism. There must be some organisms present in the sample sent for testing. If the infecting organism has left the blood stream and is sequestered in bone marrow, spleen or other tissue, then a blood sample may PCR test negative even though the organism is still present in the dog's body.

Prevention

Preventing infection from Lyme disease and other tick-borne diseases is important when showing dogs or taking an outdoor vacation with your dog in areas where infection is common. Although ticks are highly unlikely in freezing winter weather in the north, a quick spell of warm weather can cause a re-emergence of nymphal ticks (highly effective disease transmitters and difficult to detect). With the spectrum of diseases that may be out there, flea and tick prevention is essential for our dogs and for each of us, particularly when we are in unfamiliar territory.

Importantly, in the Golden Retriever Club of America Breed Health Survey (Glickman et al., 1998-1999), the use of flea and tick drops, flea and tick shampoos, or flea and tick sprays was associated with a statistically significant reduced risk for lymphosarcoma. In addition, the use of flea and tick drops was associated with a statistically significant reduced risk for hemangiosarcoma. Thus, the health survey did not indicate any adverse affects from the use of the preventatives and actually suggested a health benefit. For each of us, a discussion with our dogs' veterinarian and our physician on tick prevention may allow us to have a safer time while we all enjoy outdoor sports with our dogs.

Did you know?

· Lyme disease is caused by the spirochete (spiral shaped bacteria) Borrelia burgdorferi which is transmitted to dogs from the bite of an infected deer tick (Ixodes scapularis).

· The first case of Lyme disease in dogs was reported in 1984. Besides causing arthritis, Lyme disease can also affect the kidneys, heart, and nervous system.

· Deer ticks can produce up to 22,000 eggs in one egg clutch and may lay several clutches before they die.

· When the eggs hatch, the larvae feed on small mammals such as rodents, which may be carriers of the Lyme organism. In regions where winters are cold, it takes two years for ticks to mature, which is ideal for maintenance of infection. Tick larvae infected by feeding on rodents in the fall molt to nymphs the next spring, infecting the next generation of rodents and continuing the cycle.

· The tick's saliva has the ability to suppress the immune response of the host, allowing repeat feedings on the same host by many ticks.

· Borrelia burgdorferi is transmitted to a host via tick saliva after a lag phase of 24 to 48 hours following attachment. In mammals, the spirochete takes up residence in the layer of cells that line the inside of blood vessels and may lie dormant in connective tissue. The spirochete is difficult to detect in blood or tissue and can evade both the host's immune response and antibiotic therapy. It takes three to six weeks after infection for the production of antibodies by the host. The incubation period for the disease in naturally infected dogs is not known, but in laboratory dogs clinical signs develop from two to five months after exposure to infected ticks.

· The most common sign of Lyme disease in dogs is sudden onset of lameness, sometimes with fever, loss of appetite, and depression. One or more joints may be warm and swollen. The kidneys can also be affected, resulting in protein loss in the urine and kidney failure. Heart disease and neurological signs such as seizures can be seen in rare cases.

· It is felt that approximately 15-25% of dogs treated for Lyme arthritis will become chronically infected and have incomplete resolution of signs or reoccurring disease.

· One of the most confusing issues in the diagnosis of Lyme disease has been the significance of testing. A test result showing antibodies against Borrelia burgdorferi is merely an indication of exposure to the spirochete and by itself does not confirm a diagnosis of Lyme disease.

· The tests most often used are the Snap 3DX (tests for Lyme, heartworm, and ehrlichiosis) and the Snap 4DX (tests for anaplasmosis in addition to the other three) . These tests can be run in the veterinary hospital and do not need to be sent to a reference laboratory.

· Another test recommended for dogs that test Lyme positive is a urinalysis and a urine protein determination (microalbumin or protein:creatinine ratio). These tests help veterinarians determine whether Lyme nephritis, a fatal form of Lyme disease affecting the kidney, is present.

· Despite all of the tests available, Lyme disease remains difficult to accurately diagnose since there is no test that will detect the presence of the spirochete itself. The tests available only detect the antibodies formed by the dog's immune system in response to exposure to the Borrelia spirochete.

Much of the information provided in this article is provided courtesy of Anne McGuire, Vintage Goldens, who has compiled an outstanding FAQ on lyme and tick borne disease. Please see www.vintagegoldens.com for the complete FAQ.

Useful Health Resource Links

AKC-Canine Health Foundation
http://www.akcchf.org/

American College of Veterinary Dermatology
http://www.acvd.org/

American College of Veterinary Internal Medicine
www.acvim.org

The American Veterinary Medical Association
http://www.avma.org/

The American Veterinary Medical Association Presents Care for Pets
http://www.avma.org/care4pets/

The American College of Veterinary Surgeons
http://www.acvs.org

Baker Institute for Animal Health's Companion Animal Health Resource Center
http://bakerinstitute.vet.cornell.edu/cahrc/index.html

Canine Cancer Awareness
http://www.caninecancerawareness.org/default.asp

Canine Epilepsy Network
http://www.canine-epilepsy.net

Canine Eye Registration Foundation
http://www.vmdb.org/cerf.html

Canine Health Testing Clinic List from CavalierHealth.org:
http://www.cavalierhealth.org/health_clinics.htm

Canine Histiocytosis Site
http://www.histiocytosis.ucdavis.edu/

Colorado State University College of Veterinary Medicine & Biomedical Science Animal Cancer Center
http://www.csuanimalcancercenter.org/

Golden Retriever Foundation
http://www.goldenretrieverfoundation.org/

International Veterinary Information Service
http://www.ivis.org/

Lyme Disease information from Veterinary Partner
http://www.veterinarypartner.com/Content.plx?P=A&A=1588&S=1&SourceID=42

Merck Veterinary Manual
http://www.merckvetmanual.com/mvm/index.jsp

Morris Animal Foundation
http://www.morrisanimalfoundation.org/home.asp

Orthopedic Foundation for Animals
http://www.offa.org/

PubMed
www.pubmed.gov

The Modiano Lab
http://www.modianolab.org/index.shtml

Tick Tips from the Centers for Disease Control and Prevention
http://www.cdc.gov/ncidod/ticktips2005/

University of Pennsylvania Hip Improvement Program
http://www.pennhip.org/

UPenn Veterinary Oncology Clinical Trials
http://research.vet.upenn.edu/CurrentClinicalTrials/Oncology/tabid/2196/Default.aspx

Veterinary Partner
http://www.veterinarypartner.com/

GRCA Health & Genetics Committee
http://groups.yahoo.com/group/GRCA_Health_Genetics/

Watch for the next newsletter in late-March 2011 featuring working goldens!!!