GSCA National Specialty Breeders Health Seminar

NUTRITION & NUTRIGENOMICS

November 13, 2018

Tucson, AZ

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Hemopet
The Picture of Optimal Health
Impact of Diet on Genome & Metabolism

- **GOAL** – holistically understand how dietary components interact with/within cells & organisms to develop new strategies/products that are nutritious & safe
- **Nutrition is the most important factor for human and animal health**
- Health is achieved by understanding molecular individualized, functional nutrition
Functional Nutrition, Foods & Superfoods

- **Functional foods** include certain botanicals, amino acids, vitamins and phytochemicals that activate disease-fighting genes and suppress genes that promote disease.

- Since each individual has an unique genome, a food benefitting one might not create the same effect for another -- and could even prove harmful.

- Commercial prescription diets might work for certain subsets of animals, but they are too generalized to meet the individual needs of every animal.

- Commercial foods can send unhealthy messages to the cells as the functional effect of a food is only as good as the sum total of ingredients.
Dietary-Induced Hyperthyroidism

- In humans, excessive consumption of meat contaminated with thyroid tissue has resulted in exogenous hyperthyroidism.
- Throat/gullet in raw meat fed to dogs & cats causes hyperthyroidism; first recognized in 2012.
- Dietary hyperthyroidism can be seen in dogs or cats fed red raw meat diet or fresh or dried gullets (which include thyroid tissue). High circulating T4 concentration in a dog or cat, with or without signs of hyperthyroidism, should prompt a review of the dietary history.
- Clinical signs are readily reversed upon removing the thyroid-contaminated food or treats.
The US FDA stated on July 12, 2018 it is investigating a possible connection between grain-free pet diets, taurine, and dilated cardiomyopathy (DCM), also called canine heart disease (CHD). However, much is still unknown, and various factors impact heart health: Genetics, diet, scientific research to date, taurine needs for dogs vs cats, interaction between foods when passing through and within the body.

What do we know about taurine?

- Taurine is an amino acid found in animal-based protein and plant sources like soy in amounts that vary with the type of meat or plant.
- Taurine deficiency can lead to CHD in humans, cats, and dogs.
- **Not** an essential, food-sourced amino acid for dogs, but still present in pet foods.
- **Cats do** need food-sourced taurine to prevent CHD; minimum standards by AAFCO.
Even More on Taurine

- No effect of age, sex, body weight, body size, or diet was seen on plasma and whole blood taurine concentrations.
- Mean whole blood taurine concentrations were lower in dogs fed diets containing whole grain rice, rice bran or barley.
- The lowest whole blood concentrations were seen in dogs fed lamb or lamb meal and rice diets.
- Plasma methionine and cysteine concentrations were lower in dogs fed diets with animal meals or turkey, and whole grain rice, rice bran or barley.
- No research has established that grain-free diets can cause heart disease in dogs.
Measuring Taurine in Pets

- Need diagnostic laboratory experienced with the appropriate reference ranges for circulating taurine (see below). Special sample preparation, storage and shipping is required using sodium or lithium heparin anticoagulated tubes. If plasma taurine level is equivocal, whole blood taurine is measured to substantiate the diagnosis of deficiency.

- Amino Acid Laboratory, University of California, Davis, 1020 Vet Med 3B, 1089 Veterinary Medicine Drive, Davis, CA 95616; 530-752-5058; Fax 530-752-4698. http://www.vetmed.ucdavis.edu/vmb/aal/aal.html

<table>
<thead>
<tr>
<th></th>
<th>Plasma (nmol/ml)</th>
<th>Whole Blood (nmol/ml)</th>
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<tbody>
<tr>
<td></td>
<td>Normal Range</td>
<td>No Known Risk</td>
</tr>
<tr>
<td>Cat</td>
<td>80-120</td>
<td>&gt; 40</td>
</tr>
<tr>
<td>Dog</td>
<td>60-120</td>
<td>&gt; 40</td>
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Confounding Factors

- Confluence (merging) foods


- Homemade versus commercial

- Raw (freeze dried, dehydrated, high-pressure pasteurization)

- Contamination
  - bacterial, fungal and parasite contamination, metals, thyroid hormone, etc

- Residual pesticides and herbicides
  - glyphosate (Roundup ®); chlorpyrifos, dicambra

- Aflatoxins and mycotoxins
More Confounding Factors

❖ Undeclared ingredients not on the label

- critically assessed published discrepancies between ingredients and labeling in commercial pet foods, including those with “novel” or “limited” ingredients and containing micronized hydrolysates
- found that the median mislabeling was 45% of tested diets with a range of 33-83% for the “novel/limited” ingredients ones that are used for food elimination trials, and one hydrolyzed diet
Functional Superfoods

- Functional superfoods include: **berries**, but **not** strawberries; **coconut oil; curcumin; medicinal mushrooms; milk thistle; omega-3 fatty acids** (EPA and DHA); **pomegranates; probiotics; raw honey** products (**not** suitable for the very young); and **spirulina** (pre-biotic)

- Home-prepared diets require separate extra calcium, regardless of the diet’s quality

- Deficient nutrients that often need supplementing are linoleic acid; omega-3 fatty acids; selenium; vitamin B-6 (pyridoxine); vitamin D; vitamin E; and zinc
NUTRIGENOMICS

- Emerging science that studies the molecular relationships between nutrition and the response of genes in the genome in promoting health
- Different diets alter gene expression, and production of proteins/metabolites
- Ideal diet contains variety, nutrient-dense, whole foods
- Specific nutrients affect body responses in a form defined as a “signature”
- Individual response = “Molecular Dietary Signature”
BASIC CONCEPTS OF NUTRIGENOMICS

- Diet can be a serious risk factor for a number of diseases.
- Common dietary ingredients act on animal genome directly/indirectly, to alter gene expression/structure.
- Degree of dietary influence on balance of healthy and disease states depends on individual’s genetic makeup.
- Certain diet-regulated genes play a role in onset, incidence, progression, and/or severity of chronic diseases.
- **Dietary intervention** based on animal’s nutritional requirement/status plus genotype used to prevent, mitigate or cure chronic disease.
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**Dietary intervention** based on animal’s nutritional requirement/ status plus genotype used to prevent, mitigate or cure chronic disease.
Do all foods suit all dogs?
Future Directions

Nutrigenomics and Canine Health

- Simple tests for rancidity and antioxidant capacity should permit dog owners and breeders to select better foods
  - Monitor for antioxidant levels
  - Evaluate rancidity due to oxidation of foods – especially kibble products – over time.

- Development of functional foods, e.g. those containing natural Nrf-2 activators, has great promise
Future Directions

Nutrigenomics for Canine Health

- The effects of other dietary variables, including functional foods and saturated vs unsaturated fats need to be evaluated.
- Older, less healthy animals more likely to exhibit higher levels of disease-related biomarkers. Also more likely to benefit from induction of antioxidant pathways.
- Newer biomarkers, including metabolomic analyses, isoprostanes and miRNAs plus provide earlier assessment of diet-related health effects in younger animals.
Food Sensitivity -- Newer Testing

- Newer tests can use serum, saliva or feces
- ELISA or other immunoassay platforms
- Identify IgG, IgA, or immune complexes to foods in serum (poorly correlated to clinical signs)
- IgA or IgM antibodies to foods in saliva (excellent clinical correlation)
- Antibodies to foods appear in saliva before GI tract clinical/biopsy diagnosis of IBD or "leaky gut syndrome". Saliva testing can thus reveal the latent or pre-clinical form of food sensitivity.

[Dodds, WJ JAHVMA, 49, Winter Issue, 32-43, 2017/2018; patented worldwide]
**NUTRISCAN SUCCESS CASE**

**Darby**, 9 yr, S/F, 68 pounds, Old English Sheepdog

- Hypothyroid on thyroxine therapy; antihistamine
- Orange staining on head, ears; black skin eruptions
- Eating chicken & turkey, plus some fish & corn, veggies
- Removed these 4 foods, and head, ear & skin improved
NUTRISCAN SUCCESS CASE (cont’d)

After Ear

After Head

After Skin

RIGHT FOOD
After Thyroid Therapy + Nutriscan
Before -- Face Lesions -- Before
Before -- Eye Redness -- After
Does your dog or cat:
• have itchy skin?
• have stomach discomfort?
• belch or have gas?

Do you suspect your dog or cat has a food intolerance?

Food intolerance or sensitivity is actually quite common whereas food allergy is rare. In fact, food intolerance is the third most common sensitivity condition in cats and dogs and often can be easily remedied with a change in diet. For years, though, the difficulty lay in figuring out what foods were problematic—until now.

Developed by world renowned veterinarian, Dr. Jean Dodds, NutriScan tests for the twenty-four most commonly ingested foods by dogs and cats to provide you with specific results as to your dog's or cat's food intolerances or sensitivities. Since it is a salivary test, you have the convenience to complete the test at home or at your veterinarian's office. Best of all, you can have the results in approximately ten days to help you put your companion animal on the right diet.

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US Patent 7,867,720 and other US and international patents pending © 2013 Hemopet

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