Saturday, December 7th, 2024

Hill's®
Transforming Lives™

Small Animal Clinical Nutrition Symposium

AGING CATS & DOGS

AGENDA

Saturday
Dec. 7th
2024

7:30am — 8:30am	Registration
8:30am — 8:35am	Welcome
8:45am — 9:25am	Managing Common Senior Dog Health Conditions & Comorbidities with Nutrition Camille Torres-Henderson, DVM, DABVP, DACVIM (Nutrition)
9:35am — 10:25am	Managing Common Senior Cat Health Conditions & Comorbidities with Nutrition Camille Torres-Henderson, DVM, DABVP, DACVIM (Nutrition)
10:25am — 10:40am	Break
10:40am — 11:30am	Senior Pet Diets Camille Torres-Henderson, DVM, DABVP, DACVIM (Nutrition)
11:30am — 12:00pm	Morning Session Q&A Camille Torres-Henderson, DVM, DABVP, DACVIM (Nutrition)
12:00pm — 1:00pm	Lunch
1:00pm — 1:30pm	Weighty Matters: Tackling Canine & Feline Obesity In Senior Pets - Insights from the Healthy Weight Clinic & Pet Health Center Katherine Oakes, DVM
1:30pm — 2:20pm	Canine Cognitive Dysfunction Susan Nelson, DVM
2:20pm — 2:40pm	Break
2:40pm — 3:30pm	Nutrition Tips and Tricks for the Senior Patient: Diets and Esophageal Feeding Tubes Ally Sptiz, DVM, (Residency Trained in Small Animal Clinical Nutrition))
3:30pm — 4:00pm	Afternoon Session Q&A

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Managing Common Senior Dog Health Conditions & Comorbidities with Nutrition
Camille Torres-Henderson, DVM, DABVP, DACVIM (Nutrition) 5-56

Managing Common Senior Cat Health Conditions &Comorbidities with Nutrition
Camille Torres-Henderson, DVM, DABVP, DACVIM (Nutrition) 57-107

Senior Pet Diets
Camille Torres-Henderson, DVM, DABVP, DACVIM (Nutrition) 108-158

Weighty Matters: Tackling Canine & Feline Obesity In Senior Pets - Insights from the Healthy Weight Clinic & Pet Health Center
Katherine Oakes, DVM 159-199

Canine Cognitive Dysfunction
Susan Nelson, DVM 200-271

Nutrition Tips and Tricks for the Senior Patient: Diets & Esophageal Feeding Tubes
Ally Sptiz, DVM, (Residency Trained in Small Animal Clinical Nutrition)) 272-174

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Managing Common Senior Dog Health Conditions and Comorbidities with Nutrition

CAMILLE TORRES-HENDERSON, DVM, DABVP, DACVIM (NUTRITION)

Managing Common Senior Dog Health Conditions and Comorbidities with Nutrition

CAMILLE TORRES, DVM DABVP DACVIM (NUTRITION)

COLORADO STATE UNIVERSITY

Overview

AGE RELATED CHANGES

NUTRIENTS

PRACTICAL APPLICATION WITH COMORBIDITIES

Introduction

- Senior dogs experience physiological changes as they age.
- These changes impact their nutritional needs.
- Proper nutrition is key to managing common conditions and improving quality of life.

Senior vs Geriatric

Changes in Aging Dogs

Energy requirements

Physiologic changes

- Stomach
- Intestines

Sensory changes

Musculoskeletal changes

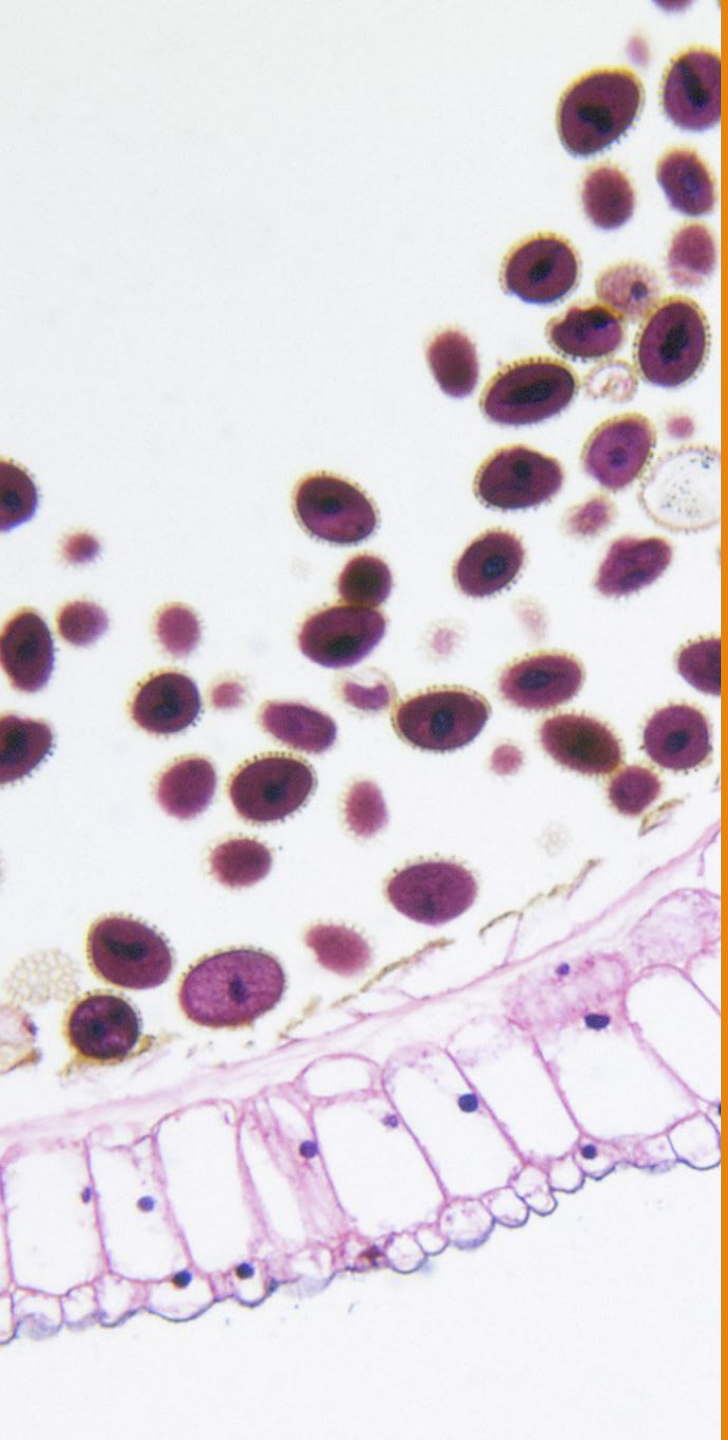
Immune function

Brain health

Physiologic Changes in Aging Dogs

Factors that could influence nutrient absorption

- Reduced duodenal villus surface area
- Shorter villus height
- Decreased HCl production in the stomach
- Decreased bile secretion



Gastrointestinal Changes in Aging People

Stomach

- Altered gastric microbiota
- Reduced mucosal protective mechanisms
- Decreased gastric blood flow
- Compromised repair mechanisms

These changes make older people more susceptible to

- Gastric ulcers
- Atrophic gastritis
- Peptic ulcer disease

Physiologic Changes in Aging Dogs

Delayed **absorption** of glucose after a meal

Serum glucose **takes longer to return to baseline** after a meal

Decreased response to ghrelin (hunger hormone)

Energy requirements

Energy requirements decrease with age, but may increase in geriatric dogs

- Decreased lean body mass

Senior dogs are at increased risk of obesity (7-10 yrs)

Geriatric dogs have a greater risk of being underweight (>10 yrs)

Calculate resting energy requirement:

- (Bodyweight in kg)^0.75 X 70

Digestibility

Studies looking at changes in digestibility are inconsistent

- In general dogs seem to maintain normal digestibility with age

Pelz et al 1968 reported ***decreased*** ability to digest fat, but *unable to replicate findings since*

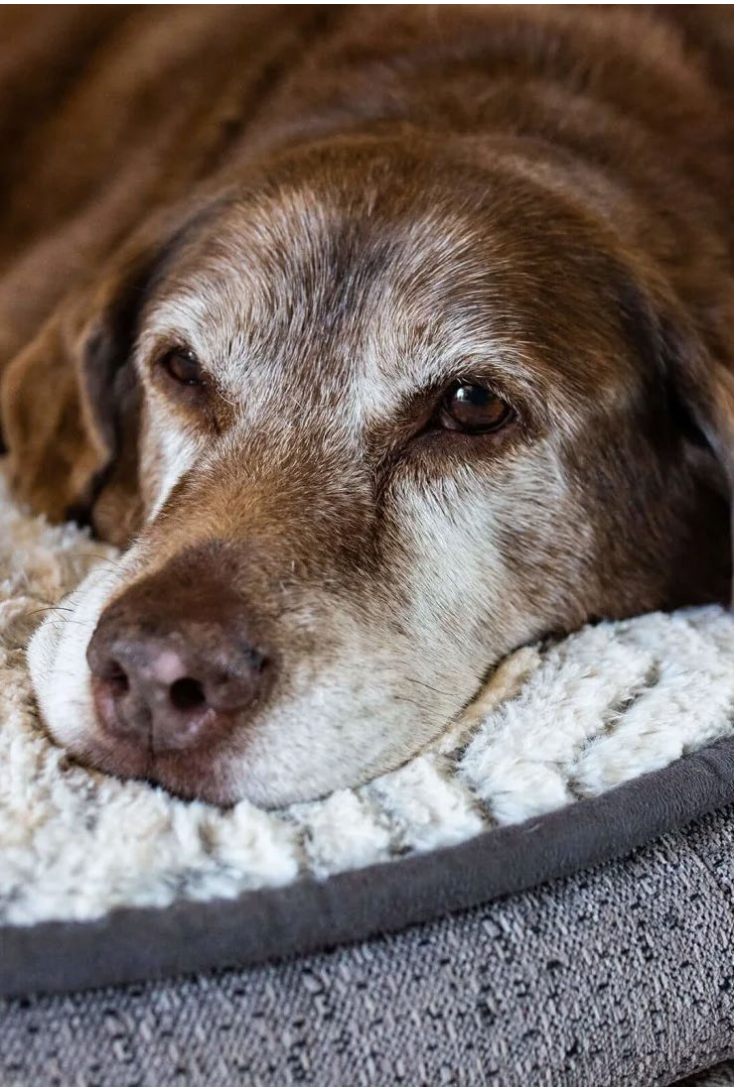
Possible reasons for decreased fat digestion:

- Decreased pancreatic function
- Pancreas is less responsive to hormones
- Decreased pancreatic lipase secretion
- Decreased production, transport and secretion of bile acids

Sensory changes that influence nutritional status

Decreased sensory capability could influence the cephalic stage of feeding

- Hearing
- Olfaction
- Taste



Musculoskeletal changes

Decrease lean body mass

- Decreased energy requirement
- Weakness and frailty

Osteoarthritis

Decreased ability to prehend and swallow food

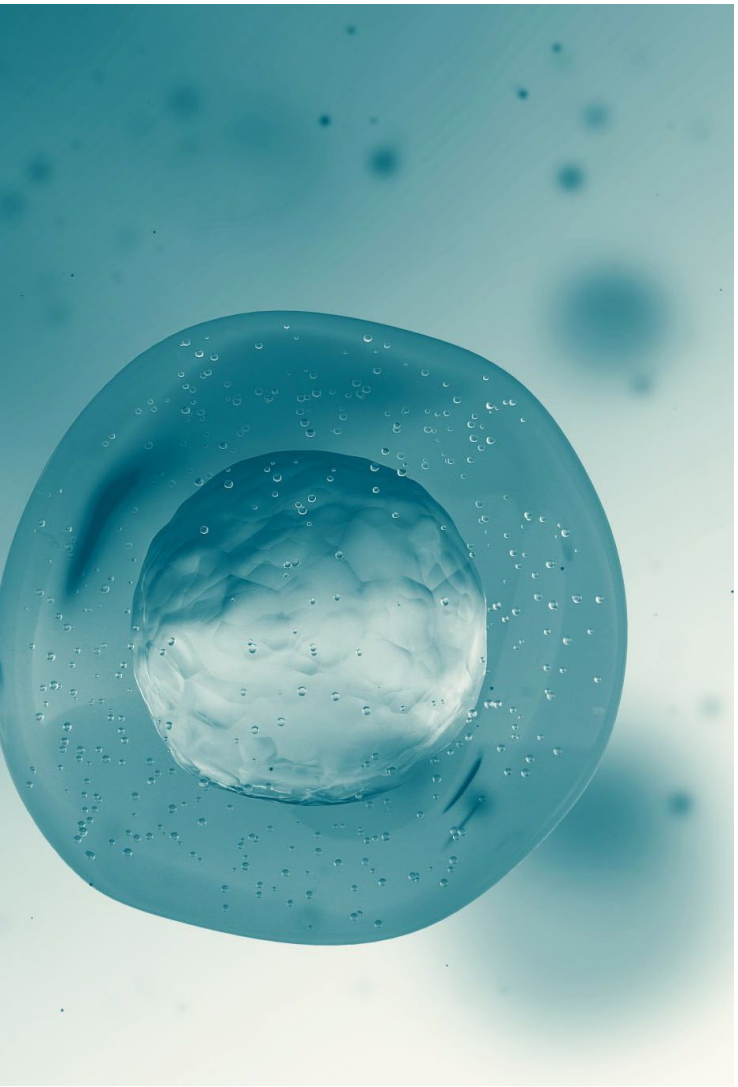
Brain Health

28-68% of dogs older than 9 yrs show clinical signs of cognitive dysfunction

Oxidative damage to the brain

- High metabolic rate of the brain produces reactive oxygen species
- High lipid content- increase susceptibility to oxidative damage
- Limited regenerative capacity

Glucose metabolism within the brain becomes less efficient with age



Immune function

Decreased total white blood cells and immature neutrophils and lymphocytes

Increased number of mature neutrophils

Mononuclear cells of older dogs are less responsive to stimuli

Decreased ability to respond to injury an illness

Summary of Physiological Changes in Senior Dogs

- Changes occur to the gastrointestinal system that could influence nutrient absorption.
- Reduced energy requirements due to lower lean body mass.
- Cognitive decline and reduced sensory functions.
- Increased susceptibility to chronic conditions.

Diets Formulated for Senior Dogs

Ideal nutritional profile for senior dogs **has not been established**

There is a wide variation in senior diets due to a lack of regulatory guidelines

Common trends in senior dog food

- Higher fiber
- Lower fat/ lower energy density
- Protein similar to maintenance formulas

Fiber can reduce digestibility

- Consider type of fiber (soluble, insoluble, fermentable, non-fermentable)

Project: *Evaluation of nutritional content in senior vs adult dog food*

61 diets evaluated (30 Adult diet and 31 Senior diets)

Fat was statistically lower in senior diets (p value: 0.0003)

Fiber was trending higher in senior diets (p value: 0.05)

Nutrients to Consider in Aging Dogs

Protein

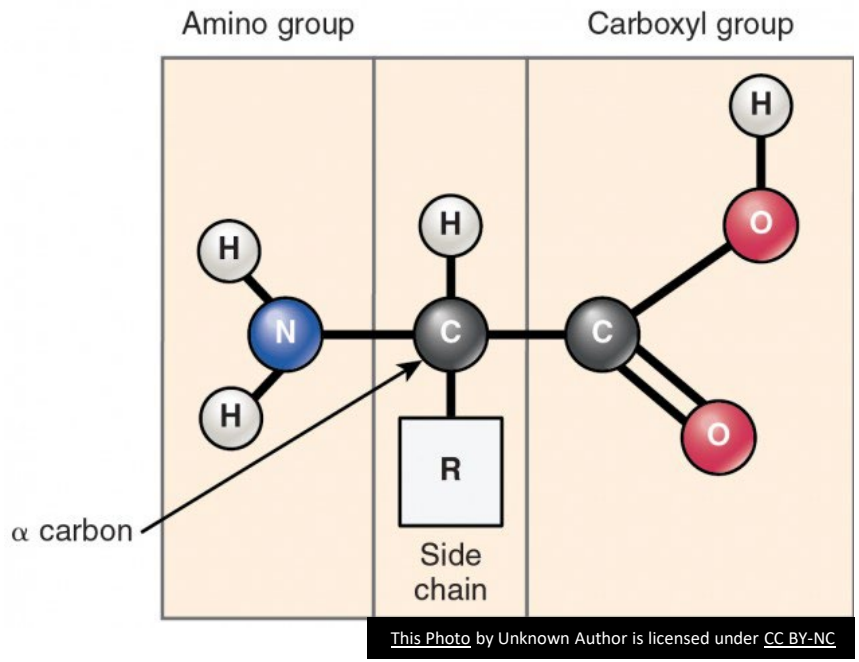
Phosphorus

Fat- energy density

Omega 3 fatty acids

Fiber

Digestibility



Protein

Synthesis and repair of tissue

Nitrogen and amino acids

Energy metabolism

- Converted to glucose by gluconeogenesis

Protein malnutrition

- Muscles
- Organ function
- Immune function

Dietary Protein & Phosphorus for Senior Dogs

Protein requirement **increases with age** due to **increased protein turnover**

- Not related to loss of digestibility
- **Sarcopenia** is age related muscle loss that is not associated with disease
- **Cachexia** is muscle loss that is related to disease

Decreased **rate of protein synthesis**

Protein restriction is not necessary unless medically indicated

Phosphorus restriction is not necessary unless medically indicated

McKenzie BA. Comparative veterinary geroscience: mechanism of molecular, cellular, and tissue aging in humans, laboratory animal models, and companion dogs and cats. *American Journal of Veterinary Research. 2022;83(6):ajvr.22.02.0027.*

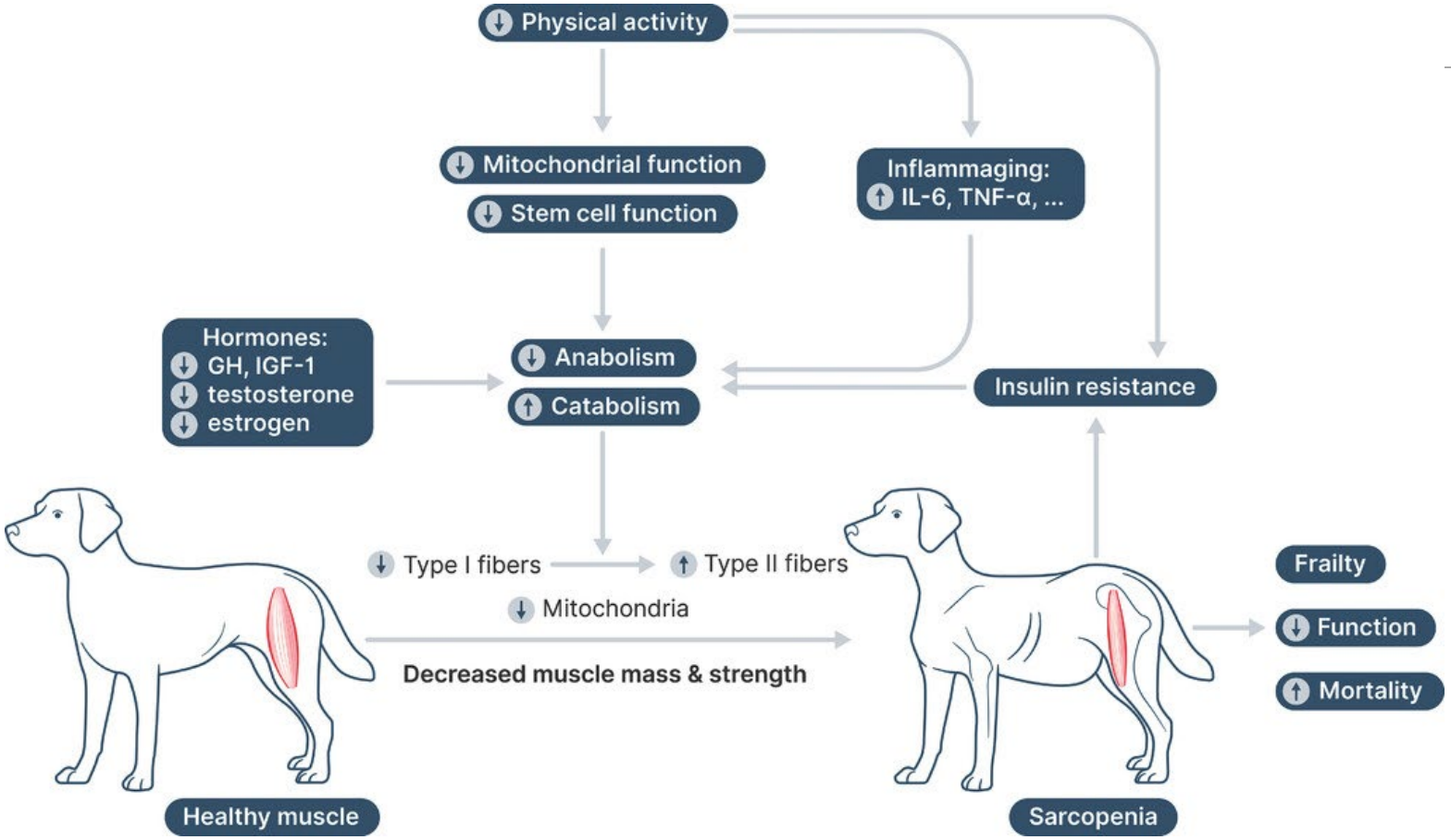
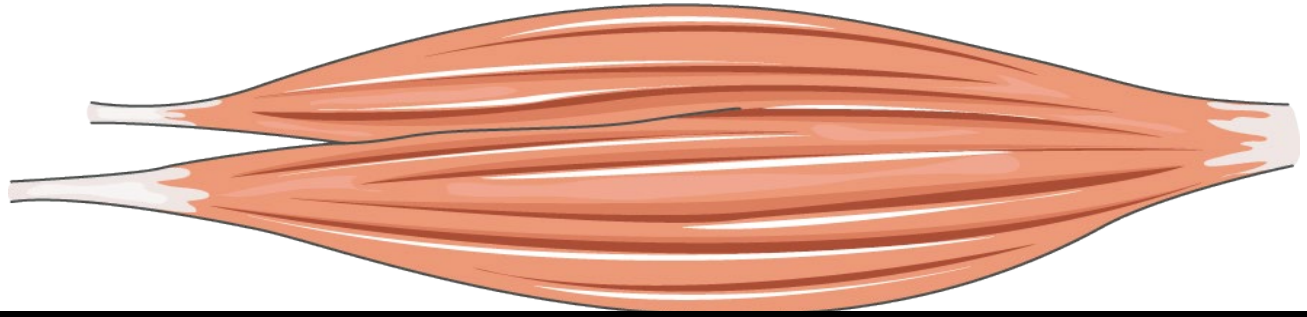
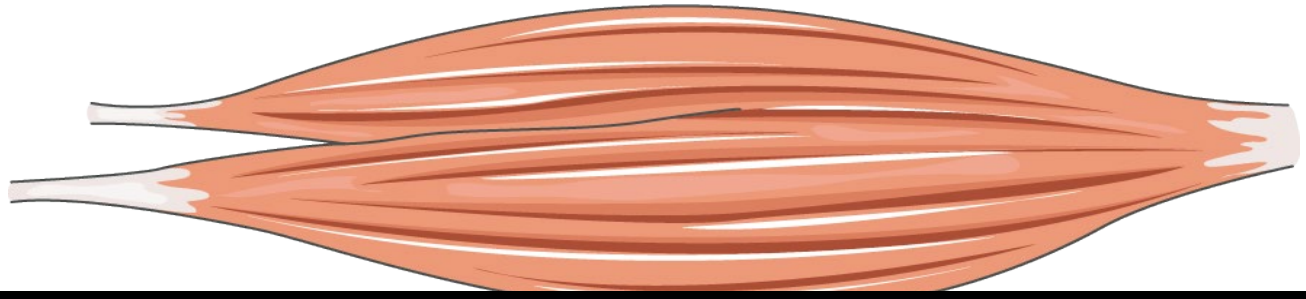
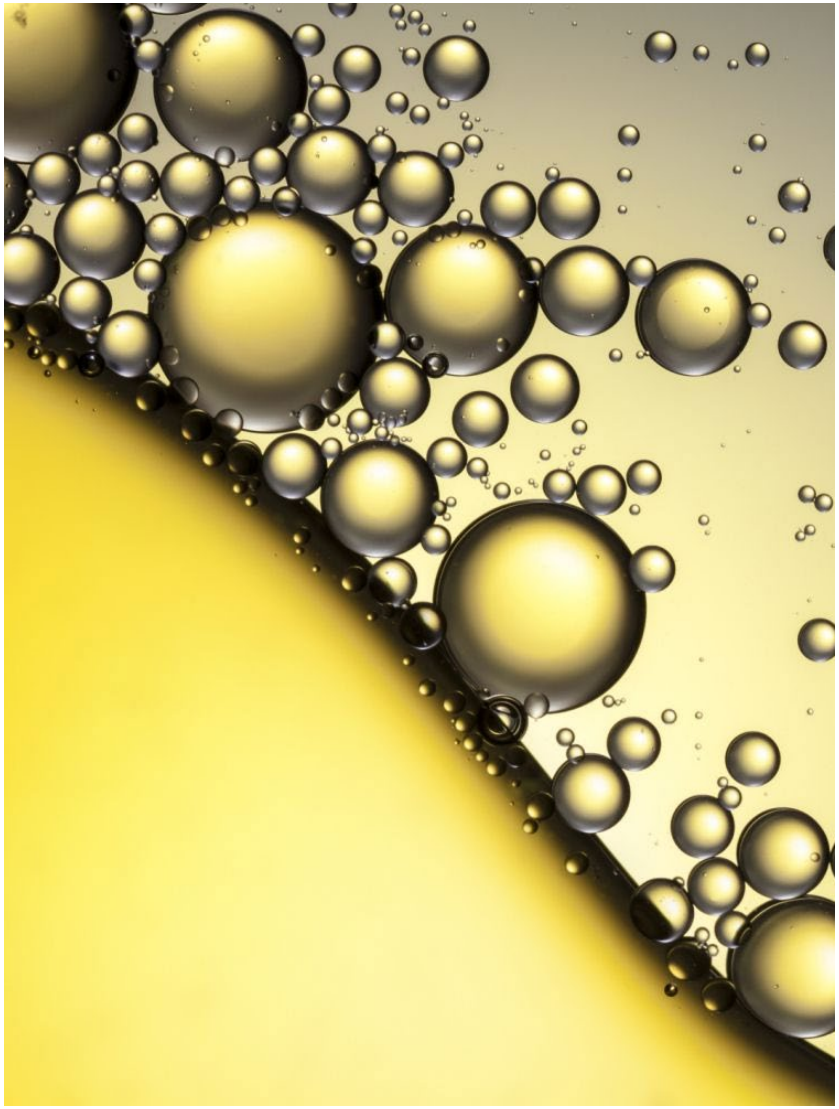


Figure 1 Key mechanisms and manifestations of muscle tissue aging. GH = Growth hormone. IGF-1 = Insulin-like growth factor-1. IL-6 = Interleukin-6. TNF-α = Tumor necrosis factor-α.

DOI: https://doi.org/10.2460/ajvr.22.02.0027







Fat

Fat provides more energy than protein or carbohydrates (per gram basis)

Required for the absorption of fat-soluble vitamins (A, D, E, K)

Essential fatty acids

- Linoleic Acid
  - Vegetable oil, corn oil, fat from animals that eat corn
- Alpha Linolenic Acid
  - Flaxseed
  - Canola oil
  - Walnut oil

Physiologic Effects of Dietary Fat

Fat stimulates increased secretion of cholecystokinin (CCK) and Peptide YY

- CCK stimulates gall bladder contraction, increase pancreatic secretion, and inhibits gastric emptying
- Peptide YY **Slows intestinal motility and slows gastric emptying**

Fat **digestion and absorption can be compromised** in dogs with gastrointestinal disease

Dietary Fat for Senior Dogs

High fat diet will increase the energy density of the diet

- Good for geriatric pets that are underweight
- Not ideal for pets at risk for obesity

Improves palatability

Physiologic changes may warrant a lower fat diet in patients with gastrointestinal signs

Consider ***individual patient needs***

(Shana Novak/DigitalVision, Getty Images)

Type of Fat

Long chain omega 3 polyunsaturated fatty acids

- Diets higher in omega 3 fatty acids may reduce inflammation
- May delay the onset and progression of physiologic aging changes (inconclusive)
- Improve appetite
- Improve cachexia
- Arthritis
  - Decrease inflammation
  - Improved clinical signs

Fish Oil Dosing

Clinical Disorder	Dose (MG/KG/DAY)	Approximate EPA + DHA (MG) Dose for a 20 KG Dog/DAY
Idiopathic hyperlipidemia	57	1135
Kidney disease	66	1324
Cardiovascular disorders	54	1088
Osteoarthritis	147	2932
Inflammatory or immunologic (atopy or IBD)	59	1182
NRC recommended allowance	14	284
NRC safe upper limit	175	3499

Raditic, D., & Gaylord, L. ***Fish Oil Dosing in Pet Diets and Supplements.*** Today's Veterinary Practice, May/June 2020.

https://www.medicalnewstoday.com/articles/320251#overview

Type of Fat

Medium chain triglycerides (MCT)

- Metabolized to ketones by the liver
- Ketones are able to cross the blood-brain barrier and can result in up to 20% sparing of glucose
- Supplementation resulted in improved cognitive performance in older dogs compared to control

Fiber

Definition: Type of carbohydrate with limited digestibility

Maintains functional integrity of the gastrointestinal tract- supports microbiome

Classification

- Soluble vs Insoluble
- Fermentable vs Nonfermentable

Types of fiber

SOLUBLE FIBER SOURCES	INSOLUBLE FIBER SOURCES	PREBIOTIC FIBER SOURCES
•Beet pulp •Fruit pectins •Psyllium- mixed •Carrageenan •Resistant starch	•Bran •Cellulose •Lignin •Hemicellulose-mixed	•Fructooligosaccharides •Inulin (chicory)

Gut Brain Axis and Aging

Age and Microbiome: Older dogs show reduced Fusobacteria in their gut microbiome.

Memory and Microbiome: Better memory correlates with lower Actinobacteria levels.

Cognitive Health: The gut microbiome may influence aging and cognitive function in dogs.

▸ Animals (Basel). 2020 Aug 24;10(9):1488. doi: 10.3390/ani10091488

Gut Microbiome Composition is Associated with Age and Memory Performance in Pet Dogs

Eniko Kubinyi [1,*,†], Soufiane Bel Rhali [1,2,†], Sára Sándor [1], Attila Szabó [2], Tamás Felföldi [2]

Summary of nutrients…

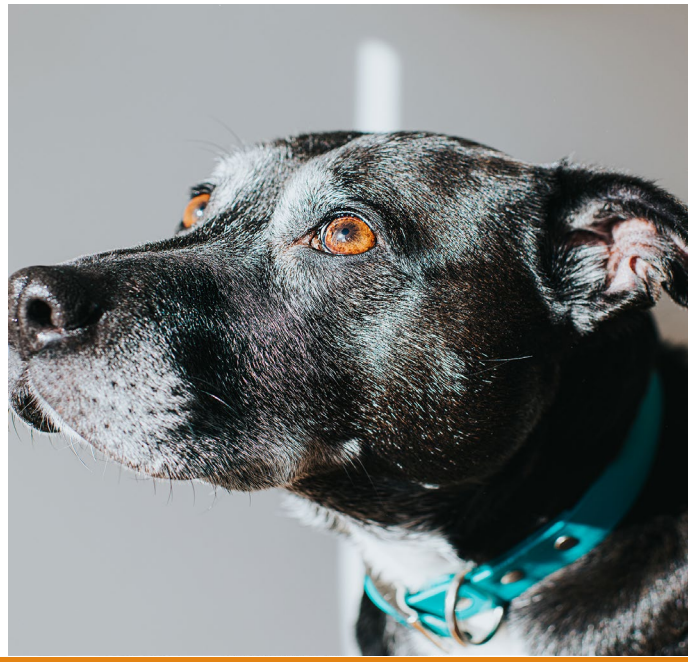
Senior diets are not standardized but tend to be lower in fat and may be higher in fiber

Adequate dietary protein intake helps support lean body mass but increasing dietary protein may not increase muscle mass in dogs with sarcopenia or cachexia.

Senior dogs do not require a low protein diet unless they have a medical condition that warrants less protein

Fat can help increase the energy density and the type of fat also has benefits.

Fiber can help support the microbiome and the gut brain axis has a connection with aging



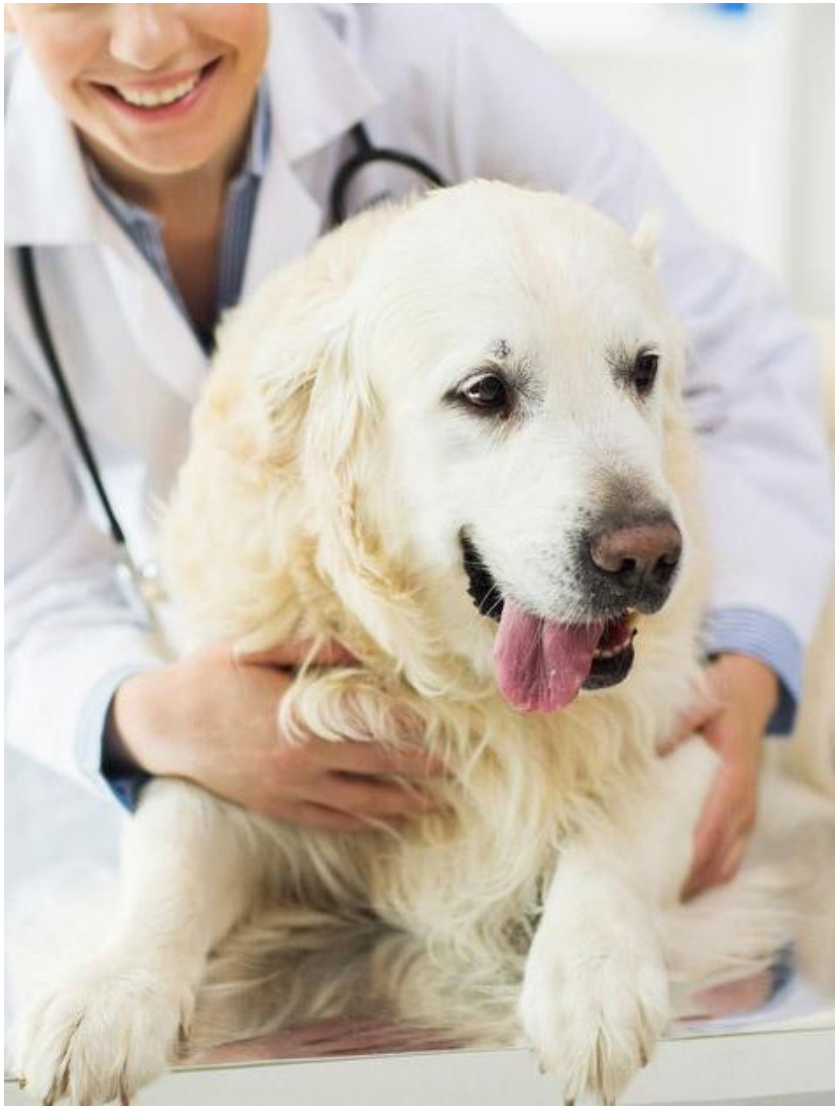

Assessment

Assessment

- Patient
- Diet
- Feeding management

Important factors to consider

- Screen and address physiologic changes caused by ***normal aging***
- Screen for and address ***age related disease***
  - Cognitive function
  - Renal function
  - Neoplasia
  - Cardiac function



Assessment – PE and Nutrition

Body condition (over/underweight?)

Muscle condition score (normal/mild/moderate/severe loss)

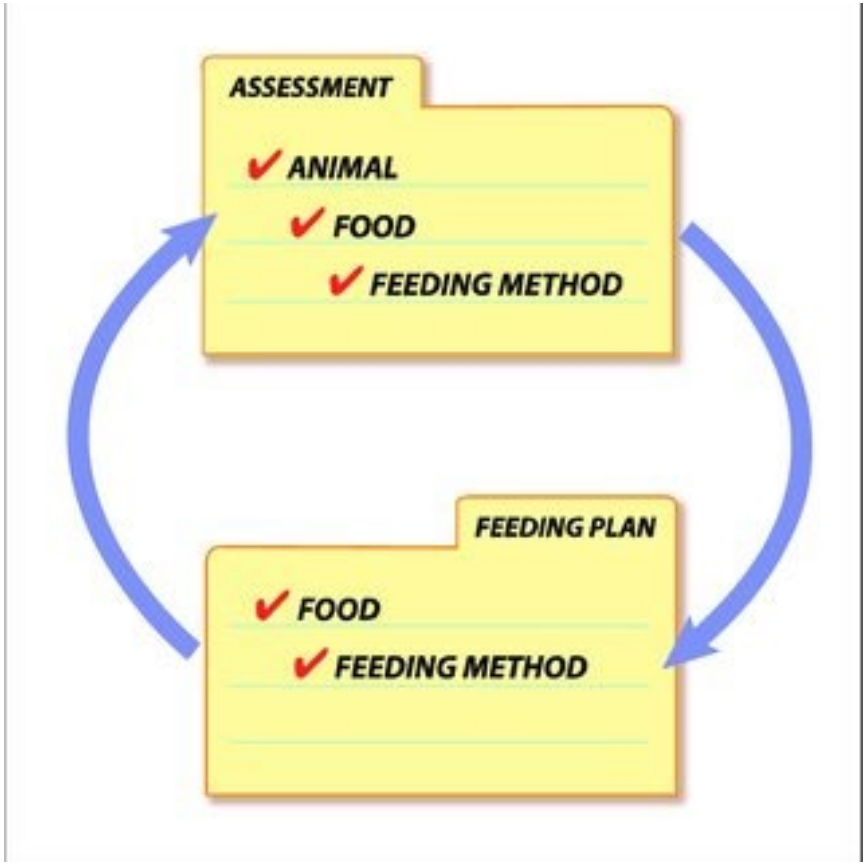
Balanced diet?

Is the caloric intake appropriate?

Can the dog prehend, masticate and swallow food appropriately?

Is the diet palatable to the dog?

Can the dog ambulate to the food and water in the house?



Create a Diet Plan

Consider the current diet

Consider age related needs

Consider disease related needs

Review diet options and provide specific feeding recommendations

Reassess on a regular basis

Izzy- 14 year old, spayed female, Welsh Corgi

Age related changes

- Osteoarthritis
- Cognitive dysfunction
- Decreased ability to prehend food
- Hearing loss
- Decreased lean body mass

Disease related changes

- Proteinuria (UPC- 2.3)
- Renal azotemia (BUN- 63, Creat- 2.3; USG- 1.022)
- Intermittent gastrointestinal signs, supspect chronic pancreatitis

Izzy- Current diet

A rotation of several diets to keep her interested in eating:

- Hill's i/d (regular and low fat, dry and canned)

- Purina EN Low Fat (canned and dry)

- Hill's k/d

- Purina NF

- Home prepared diet- beef, rice, bread

- Unable to determine current caloric intake

Izzy physical exam and assessment

10 kg

BCS 3/9

Moderate to severe generalized muscle loss

Nutrition assessment:

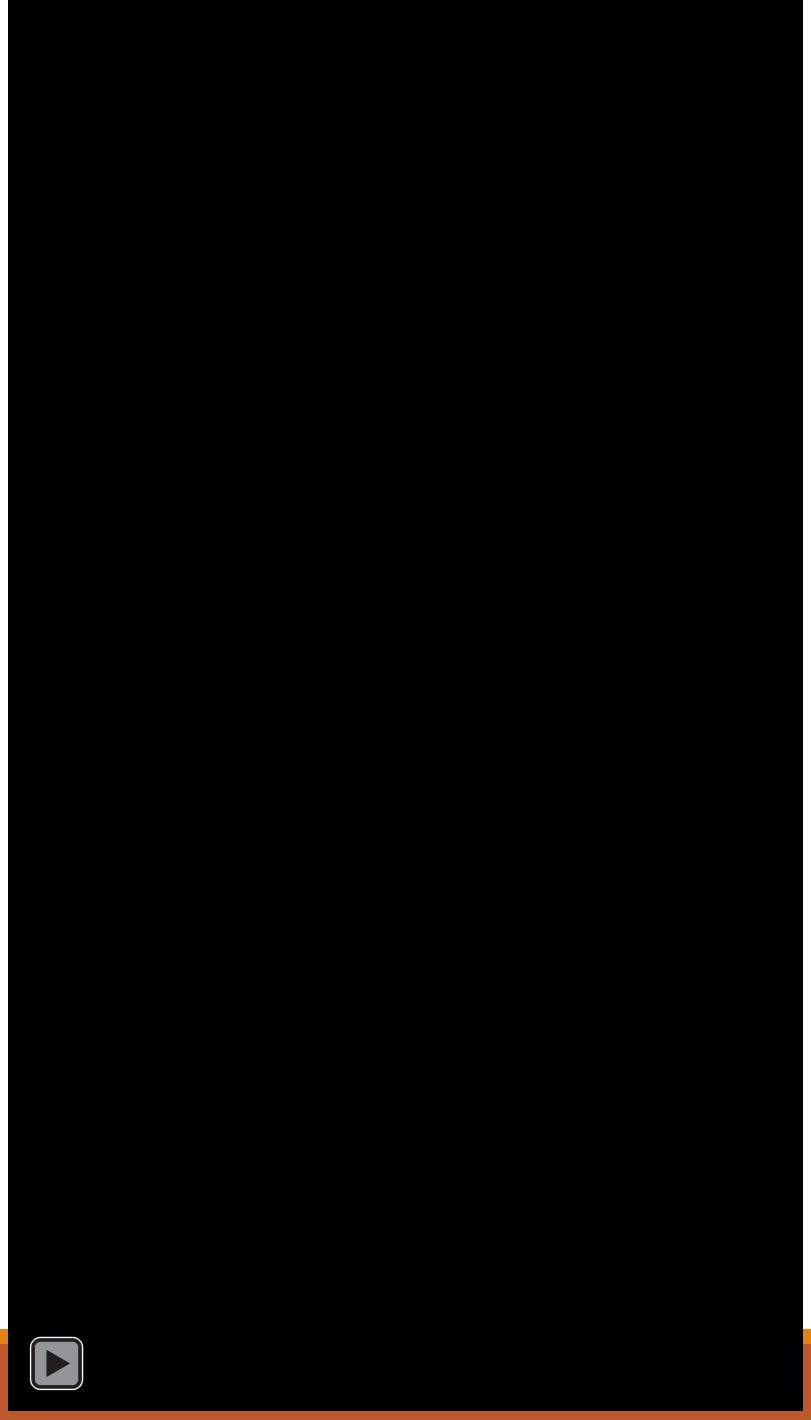
Balanced diet?

Is the caloric intake appropriate?

Can the dog prehend, masticate and swallow food appropriately?

Is the diet palatable to the dog?

Can the dog ambulate to the food and water in the house?



Let's watch Izzy…

Nutrition assessment

Nutrition assessment:

Balanced diet?

- **No (eating >90% of calories from unbalanced food source)**

Is the caloric intake appropriate?

- **No (not meeting RER, losing weight, losing muscle)**

Can the dog prehend, masticate and swallow food appropriately?

- **Maybe**

Is the diet palatable to the dog?

- **Yes and no (does not eat the same diet consistently)**

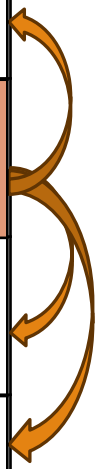
Can the dog ambulate to the food and water in the house?

- **Yes, but has limitations (generalized OA)**

Disease	Protein	Omega-3 Fatty Acids	Phosphorus	Digestibility	Fat	Energy Density	Palatability
Proteinuria	Low	Yes	Controlled?				
Renal Dysfunction	Low	Yes	Low	High	High	High	High
Gastrointestinal Disease/ Pancreatitis	Type of protein			High	Low	High	High
Underweight	Moderate to high	Yes		High	High	High	High
Muscle Loss (Cachexia)	High	Yes		High	High	High	High

Nutrients to consider

Disease	Protein	Phosphorus	Fat
Proteinuria	Low	**Controlled?**	
Renal Dysfunction	Low	**Low**	**High**
Gastrointestinal Disease/ Pancreatitis	**Type of protein**		Low
Underweight	**Moderate to high**		**High**
Muscle Loss (Cachexia)	**High**		**High**



Nutrients to consider

How to manage comorbidities

- Tailor recommendations to the individual patient.
- Assess the current diet and adjust based on existing intake.
- Prioritize conditions based on their clinical significance.
- Evaluate diet options by reviewing nutrients on a calorie basis (e.g., grams per 100 or 1,000 kcal) or caloric distribution (% of metabolizable energy- ME).

Diet	Protein (g/1000 kcal)	Fat (g/1000 kcal)
Purina EN Low Fat canned	120	24.5
Purina EN Low Fat dry	81	19.5
Hill's i/d Low Fat dry with chicken	72	21
Hill's i/d dry chicken flavor	68	37
Hill's i/d Stew Chicken and Vegetable	65	38
Hill's i/d Stew	64	24
Purina NF canned	42	59
Purina NF dry	41.5	42
Hill's k/d stew	37	53
Hill's k/d dry with chicken	36	49

Current diet- sorted by protein (low protein <42 g/1000 kcal)

Diet	Protein (g/1000 kcal)	Fat (g/1000 kcal)
Purina EN Low Fat dry	81	19.5
Hill's i/d Low Fat dry with chicken	72	21
Hill's i/d Stew	64	24
Purina EN Low Fat canned	120	24.5
Hill's i/d dry chicken flavor	68	37
Hill's i/d Stew Chicken and Vegetable	65	38
Purina NF dry	41.5	42
Hill's k/d dry with chicken	36	49
Hill's k/d stew	37	53
Purina NF canned	42	59

Current diet- sorted by fat (low fat <25 g/1000 kcal)

Diet	Protein (g/1000 kcal)	Fat (g/1000 kcal)
Purina EN Low Fat canned	120	24.5
Purina EN Low Fat dry	81	19.5
Hill's i/d Low Fat dry with chicken	72	21
Hill's i/d dry chicken flavor	68	37
Hill's i/d Stew Chicken and Vegetable	65	38
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Purina NF dry	41.5	42
Hill's k/d dry with chicken	36	49
Hill's k/d stew	37	53
Purina NF canned	42	59

Compare diets:
protein- 42 g/1000 kcal
fat- <25 g/1000 kcal

Diet	Protein (g/1000 kcal)	Fat (g/1000 kcal)
Hill's g/d dry	48	29
Hill's g/d canned	49	28
Hill's z/d dry	49	37
Royal Canin Renal Support + Advanced Mobility Support dry	35	41
Just Food For Dogs Hepatic Low Fat Fresh Frozen	52	17.5
Just Food For Dogs Hepatic Low Fat Pantry Fresh	41	22

Look for diets in other categories
protein- 42 g/1000 kcal
fat- <25 g/1000 kcal

Summary

Nutrition Matters: Aging impacts energy, protein, and fat needs.

Individualized Care: Tailor diets to individual needs and comorbidities.

Nutrient Guidelines: Specific guidelines for senior diets do not exist, base recommendations on your patients needs

Practical Steps: Evaluate diets by nutrients per calorie; reassess regularly.

Thank you

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Managing Common Senior Cat Health Conditions and Comorbidities with Nutrition

CAMILLE TORRES-HENDERSON, DVM, DABVP, DACVIM (NUTRITION)

Managing Common Senior Cat Health Conditions and Comorbidities with Nutrition

CAMILLE TORRES DVM, DABVP, DACVIM (NUTRITION)

Overview

CHANGES IN AGING CATS

NUTRIENTS

NUTRITIONAL MANAGEMENT OF COMMON CONDITIONS

Changes in Aging Cats

Defining age groups

Energy requirements

Digestion in aging cats

Microbiome

Musculoskeletal

Cognition

Age groups

Cats can be divided into ***4 life stages***:

- Growth
- Adult (up to 6 yr)
- Mature (7-12 yr)
- Geriatric (12+ yr)

Chronologic age does not always match ***physiologic age***

Patient needs must be addressed on an individual basis

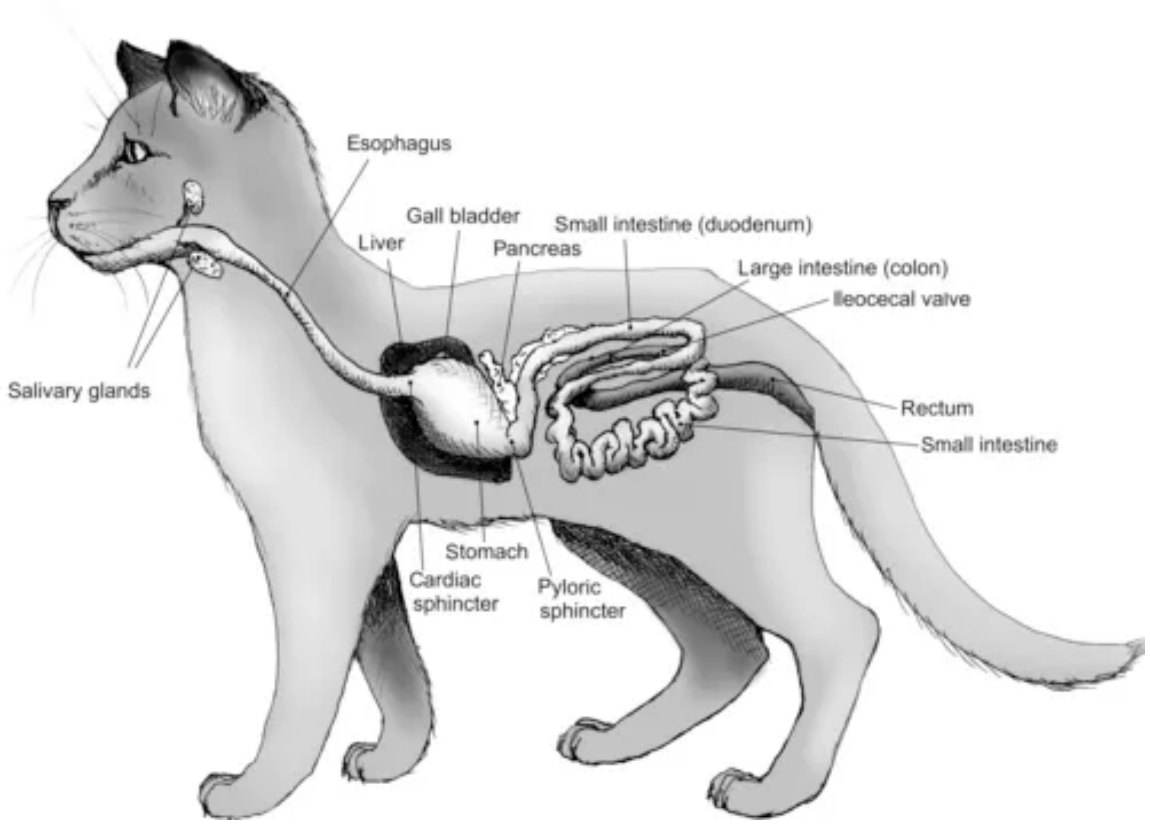
Energy Requirements of Aging Cats

Mature cats (7-12 yr) have ***reduced*** energy requirements

- More likely to become overweight
- More likely to show evidence of chronic disease

Geriatric (12+ yr) tend to have ***increased*** energy requirements

- More likely to be underweight



Digestion and Aging Cats

Reduced ability to digest fat

- 10-15% of mature cats demonstrate impaired fat digestibility
- 33% of geriatric cats have reduced fat digestibility

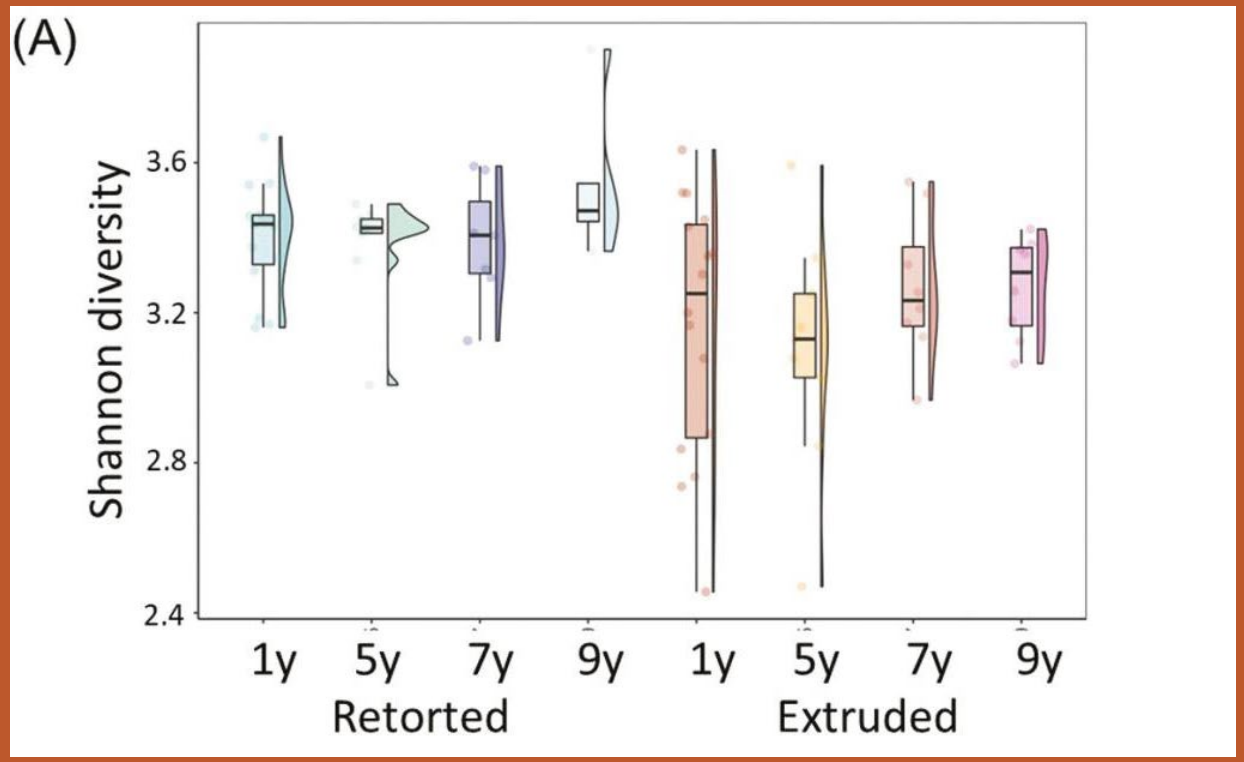
Reduced ability to digest protein in 20% of cats >14 years of age

Decreased gastric motility- may see constipation

Result: Weight loss

- Decreased ability to digest nutrients
- Gradual with age
- Common first sign of disease

Microbiome- diversity



Bermingham, E.N., Young W., Butowski C.F., Moon C.D., Maclean P.H., Rosendale D., Cave N.J., and Thomas D.G... 2018. The fecal microbiota in the domestic cat (Felis catus) is influenced by interactions between age and diet: a five year longitudinal study. Front. Microbiol. 9:1231. doi: 10.3389/fmicb.2018.01231

ANIMAL FRONTIERS
OXFORD UNIVERSITY PRESS

Anim Front. 2024 Jun 20;14(3):5–16. doi: 10.1093/af/vfae008

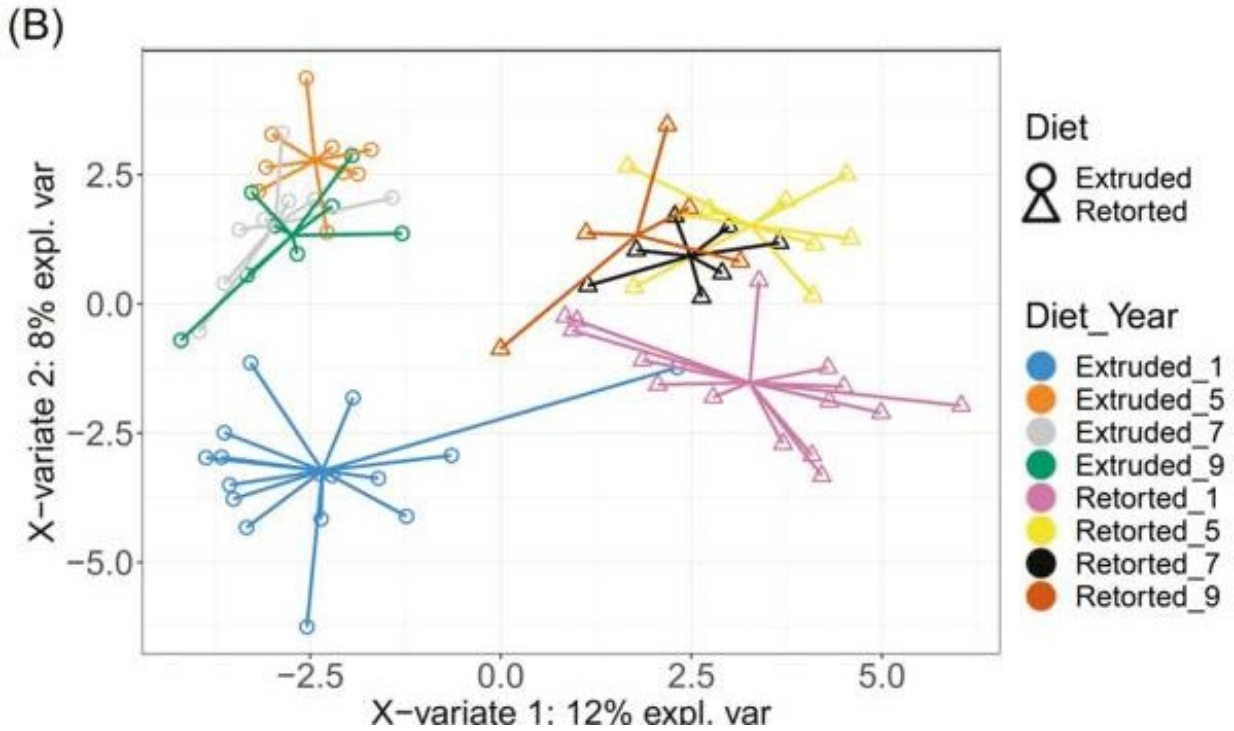
Nutritional needs and health outcomes of ageing cats and dogs: is it time for updated nutrient guidelines?

Emma N Bermingham [1,✉], Keely A Patterson [2,3], Anna K Shoveller [4], Karl Fraser [5,6], Christina F Butowski [7], David G Thomas [8]

Microbial diversity remains consistent with age

Extruded= dry food

Retorted= wet food



Microbial Diversity

- **Microbial Diversity**: Wet diets **increased diversity** compared to dry diets, regardless of age.
- **Age-Associated Profiles**: Young cats had distinct microbiomes compared to older cats.
- **Diet-Dependent Populations**: Wet and dry diets resulted in **different microbial populations**.

Musculoskeletal changes

Aging leads to a reduction in lean body mass and an increase in fat mass.

- reduced strength and mobility

Sarcopenia can be exacerbated by insufficient dietary protein or negative energy balance

Degenerative joint disease more common with age.

Reduced physical activity due to joint pain further impacts quality of life.

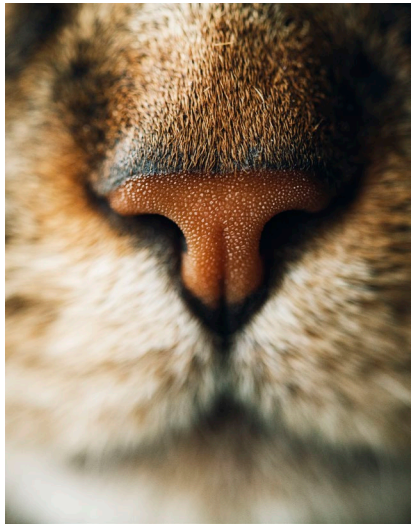
Brain Health

Feline cognitive dysfunction- affects 28-50% of geriatric cats

- Behavioral changes
- Excessive vocalization
- Inappropriate elimination
- Altered sleep habits
- Mood changes

What to do:

- Environmental enrichment
- Middle-aged cats fed a combination of fish oil, antioxidants, arginine and B vitamins enhanced brain function
- In cases of severe cognitive dysfunction implementing a change can have negative effects due to poor coping ability.



Sensory

Reduced:

- Taste
- Smell
- Vision

Impacts their interest in eating -> leading to weight loss

Solution:

- Ease of access
- Food with different aromas and flavors
- Modify temperature (preferred temperature is 98°F)

Summary so far…

Energy requirements change as cats age

Digestibility of protein and fat decreases with age

Musculoskeletal changes

Sensory and cognitive changes

Nutrients

Nutrients that provide energy

Protein

Carbohydrates

Fat

Protein

Cats have higher protein requirements than dogs

- Protein turnover
- Continuous gluconeogenesis

When dietary protein is not adequate, cats will use protein from muscle to support protein synthesis

Protein

Estimated amount of protein to maintain lean body mass

- Adult cats
  - 5 g protein/kg body weight (34% protein ME)

For cats with **low energy requirements**, the diet may need to be **higher in protein** to meet their needs

Use muscle condition scoring

Carbohydrates

Cats have a requirement for glucose at a cellular level but they do not require carbohydrates from the diet

Cats can effectively digest and absorb carbohydrates

Cats can synthesize glucose using gluconeogenic amino acids from the diet or from endogenous sources

Carbs and Cats: Nutrition Myths and Realities

- Cats do not have glucokinase activity in the liver
  - Enzyme responsible for conversion of glucose to glucose 6 phosphate
  - This enzyme functions under high glucose loads and lack of this enzyme may slow use of glucose
- Decreased levels of amylase, sucrase and lactase in the pancreas and intestine compared to dogs
  - Diets containing lactose and sucrose decreased protein digestibility by 4-5% compared to carbohydrate free
  - Digestibility of simple sugars remains 98%-100% despite lower enzyme levels
- Constant hepatic glucose production (gluconeogenesis)
  - Cannot downregulate aminotransferases and urea cycle enzymes
  - Cats increase glucose production after a meal to offset increased levels of insulin

Carbs and Cats: Nutrition Myths and Realities

- Pet food has complex carbohydrates rather than simple sugars
  - Simple sugars are not metabolized as efficiently but complex carbohydrates are
- In a low carbohydrate diet fat and protein must increase to account for the energy that would have come from carbohydrates
- Fat deposition is higher with a high fat diet and lower with a high carbohydrate diet
- High fat diet compared to a high carbohydrate diet
  - Delayed glucose clearance
  - Decreased insulin response to glucose administration
  - Explanation: high fat diet may cause decrease pancreatic insulin secretion and/or decrease beta cell response to glucose

Carbs and Cats: Nutrition Myths and Realities

Canned Food

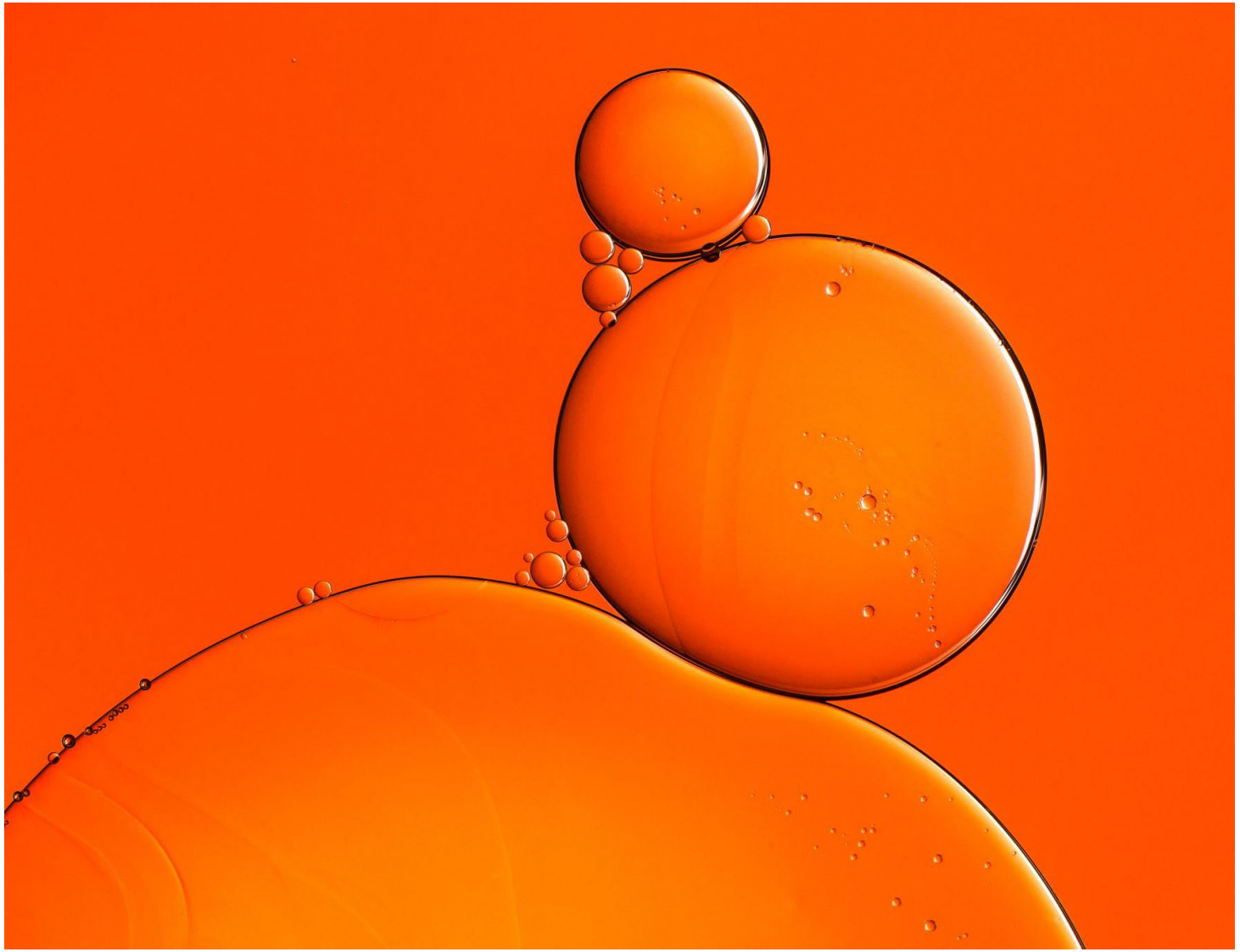
- Perception: Canned food is low in carbohydrates
- **Fact**: each diet should be evaluated individually for the caloric distribution

Obesity

- Perception: High carbohydrate diets cause obesity
- **Fact**: High fat diets are more likely to cause obesity

Diabetes

- Perception: High carbohydrate diets cause diabetes
- **Fact**: Elevation in blood glucose and insulin is a normal physiologic response and have not been proven to be detrimental
- **Fact**: Obesity led to insulin resistance and delayed clearance of glucose rather than the amount of protein or carbohydrate in the diet



Fat

Concentrated source of energy that can be stored or used

Cats typically can tolerate a high fat diet

Improves palatability

Geriatric cats may need to eat more calories to maintain weight in comparison with younger cat that is the same size

- But…33% of geriatric cats have reduced fat digestibility

True or False?

I recently diagnosed a 12-year-old cat with chronic kidney disease (IRIS stage 1, non proteinuric, non hypertensive).

I should change her diet from an adult maintenance diet to a senior cat diet.

False: Senior diets for cats are similar to adult maintenance diets

Senior diets differed in crude fiber but otherwise there weren't any significant differences in nutrients compared to maintenance formulas

AAFCO does not have guidelines for senior pets

The nutrient profile for senior cat diets is variable

It is a misconception that all senior diets are lower in a specific nutrient like phosphorus or protein

ACVIM American College of Veterinary Internal Medicine

JOURNAL OF VETERINARY INTERNAL MEDICINE Open Access

STANDARD ARTICLE | Open Access

Evaluation of nutrient content and caloric density in commercially available foods formulated for senior cats

Stacie C. Summers, Jonathan Stockman, Jennifer A. Larsen, Anais Sanchez Rodriguez, Lei Zhang

First published: 10 July 2020 | https://doi.org/10.1111/jvim.15858 | Citations: 9

Summary of nutrients…

Inadequate dietary protein intake can result in muscle loss

While cats have differences that effect glucose metabolism, they can still eat diets that include carbohydrates.

Canned food is not always low in carbohydrates

High fat diets are more likely to contribute to obesity, and obesity is more likely to cause insulin resistance

The nutrient profile for senior diets is variable, review the nutrient profile of the diet and compare to the current diet

Nutritional management for senior cats

Assessment of the Patient

Physical exam

- Body condition score is a good indicator of body fat
- **Muscle mass score** is an indicator of lean muscle mass
- Decrease in lean body mass (LBM) can indicate disease or malnutrition
  - Maintenance of LBM may delay morbidity and mortality
  - Non obese cats that maintain fat and LBM lived longer than cats losing fat and LBM
  - Preservation of body weight and body condition has the strongest correlation with survival
- Unintended weight loss should be investigated

General Diet Recommendations for Senior Cats

Evaluate the current diet

Commercial diets labeled for senior cats can vary greatly in the nutrient content

Some senior diets are formulated to be lower in calories which may not be appropriate for senior cats that are losing weight

Diet recommendations should consider a patient's individual needs

Provide specific diet and feeding recommendations

Common Conditions in *Overweight* Senior Cats

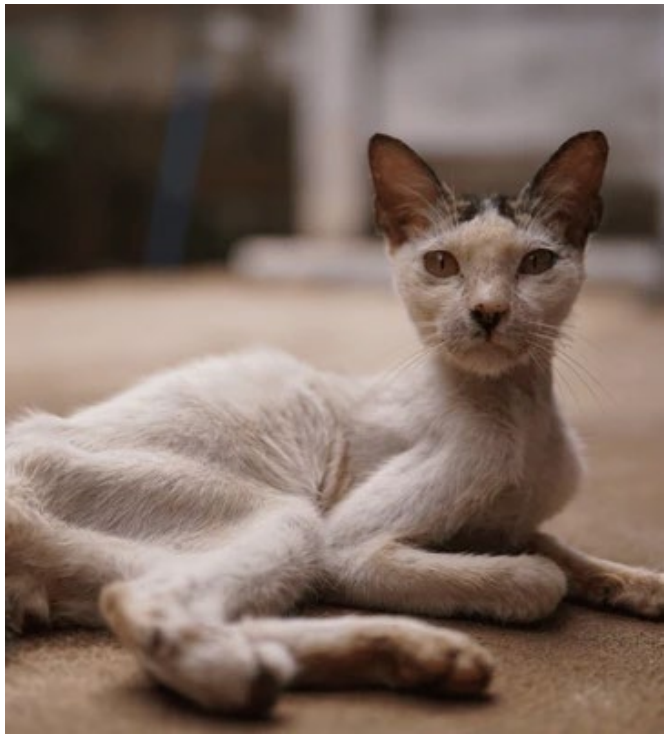
Obesity contributes to decreased life span and is associated with weight related diseases:

- Diabetes
- Lameness
- Lower urinary tract disease
- Hepatic lipidosis
- Skin problems

Common Conditions in *Underweight* Senior Cats

First step: determine if weight loss is associated with changes in food intake

- Weight loss despite ***normal to increased*** intake
  - Hyperthyroid
  - Diabetes
  - IBD
  - Lymphoma
- Weight loss with ***decreased*** intake
  - Reduced sense of smell or taste
  - Pain- periodontal disease
  - Reduced digestive function
  - Organ dysfunction- renal, pancreatitis, triaditis



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Addressing Unintentional Weight Loss in Senior Cats Without a Medical Condition

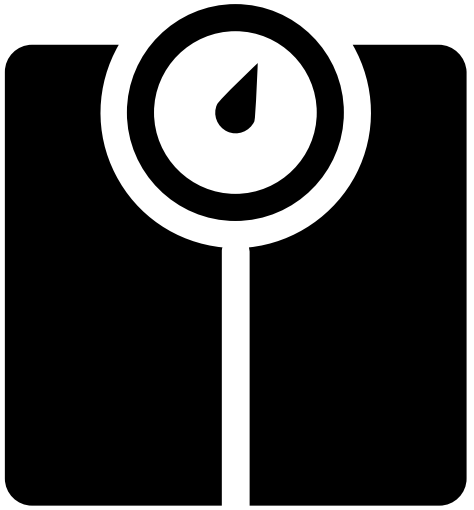
Highly palatable diet

High energy density

Highly digestible

Small amounts frequently

Increased protein intake can helpreduce but not prevent age associated lean body mass loss (sarcopenia)



Accommodations for Aging Cats

Easy access to food, water, litterbox and bedding

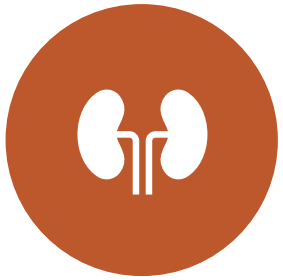
Use ramps or place food and water on lower surfaces for ease of access

Provide multiple places for resting with padded comfortable bedding

Litterbox- 1+ the number of cats in house, low sides for ease of access

Provide hiding places, including elevated sites

Nutritional management of disease



Renal disease

Gastrointestinal disease

Chronic Kidney Disease in Cats

Feeding cats with CKD a therapeutic renal diet resulted in longer survival with fewer uremic crises.

There is no evidence that feeding a renal diet to cats before IRIS stage2 will slow progression (?)

- Control of phosphorus is considered primary goal at early stage

Goals of therapy

- Provide complete nutrition
- Address metabolic changes

Omega 3 fatty acids from fish oil may be beneficial to cats with IRIS stage 2 disease

Cats with proteinuria (at any stage of CKD) may benefit from protein restriction and omega 3 fatty acids

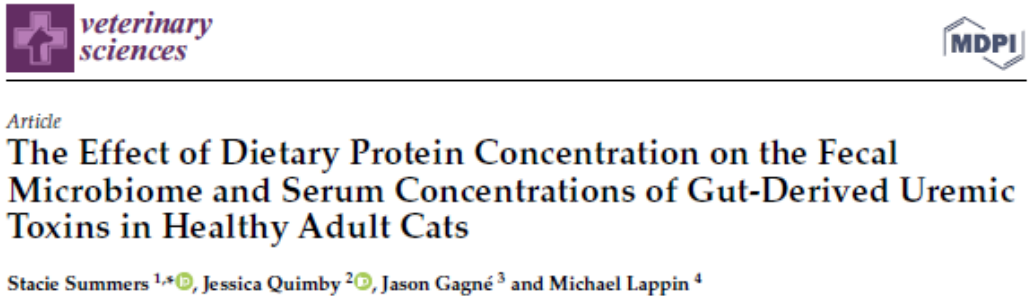
Controversy!

There is concern that protein restriction adversely effects lean body mass which has a negative effect on patient outcomes

Consensus has not been reached on whether to start a renal diet for IRIS stage 1 cats and dogs

Kidney remnant model found that dietary protein did not matter in renal disease

However…



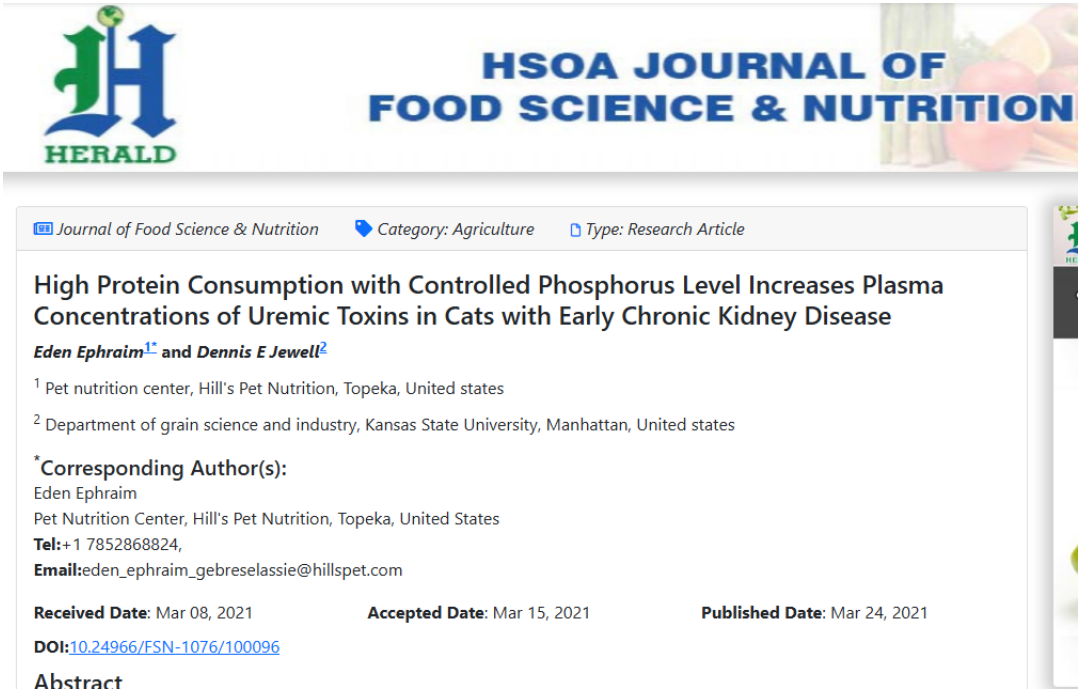
veterinary sciences

MDPI

Article

The Effect of Dietary Protein Concentration on the Fecal Microbiome and Serum Concentrations of Gut-Derived Uremic Toxins in Healthy Adult Cats

Stacie Summers [1,*], Jessica Quimby [2], Jason Gagné [3] and Michael Lappin [4]



HERALD

HSOA JOURNAL OF FOOD SCIENCE & NUTRITION

Journal of Food Science & Nutrition | Category: Agriculture | Type: Research Article

High Protein Consumption with Controlled Phosphorus Level Increases Plasma Concentrations of Uremic Toxins in Cats with Early Chronic Kidney Disease

Eden Ephraim[1*] and *Dennis E Jewell*[2]

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[2] Department of grain science and industry, Kansas State University, Manhattan, United states

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DOI:10.24966/FSN-1076/100096

Abstract

Dietary protein ***may*** have more of an impact than we realized…

Protein and uremic toxins

Protein that is not absorbed reaches the colon and supports growth of proteolytic bacteria (20% of geriatric cats have decreased ability to digest protein)

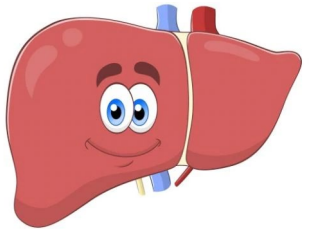
Bacteria ferment amino acids and produce indole and phenol (uremic toxins)

Cats with CKD have increase blood concentration of urea, creatinine and ***uremic toxins***

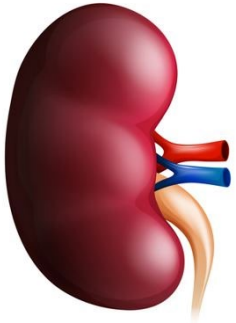
- Uremic toxins have a negative impact on the kidneys (inflammation, increased oxidative stress)

When cats with early CKD were fed a controlled phosphorus diet that was high in protein they had an increase plasma concentration of uremic toxins (Ephraim 2021)

- High protein diets may have a negative impact on renal disease even if phosphorus is controlled
- Feeding CKD cats protein restricted diet may slow progression by reducing accumulation of uremic toxins



With declining kidney function there is a buildup of waste products from metabolism



What is in a renal diet?

- Lower in protein
- Phosphorus restriction
- Omega 3 Fatty acids
- Acid base balance
- Antioxidants
- Electrolyte balance

Early Renal vs Renal Cat Diets

	Early Renal Diets: Protein g/1000 kcal	**Early Renal Diets**: Phosphorus g/1000 kcal	**Renal diets-** Protein g/1000 kcal	**Renal diets-** phosphorus g/1000 kcal
Purina NF canned cat food	95	1.0	67	0.9
Purina NF dry cat food	90	0.9	69	0.9
Hill's k/d canned	76	1.3	66-76	1.1- 1.2
Hill's k/d dry	79	1.3	66-68	1.2
Royal Canin Renal Support canned	84	1.2	66-70	0.8-1.0
Royal Canin Renal Support dry	73	1.3	58-65	1.0-1.1

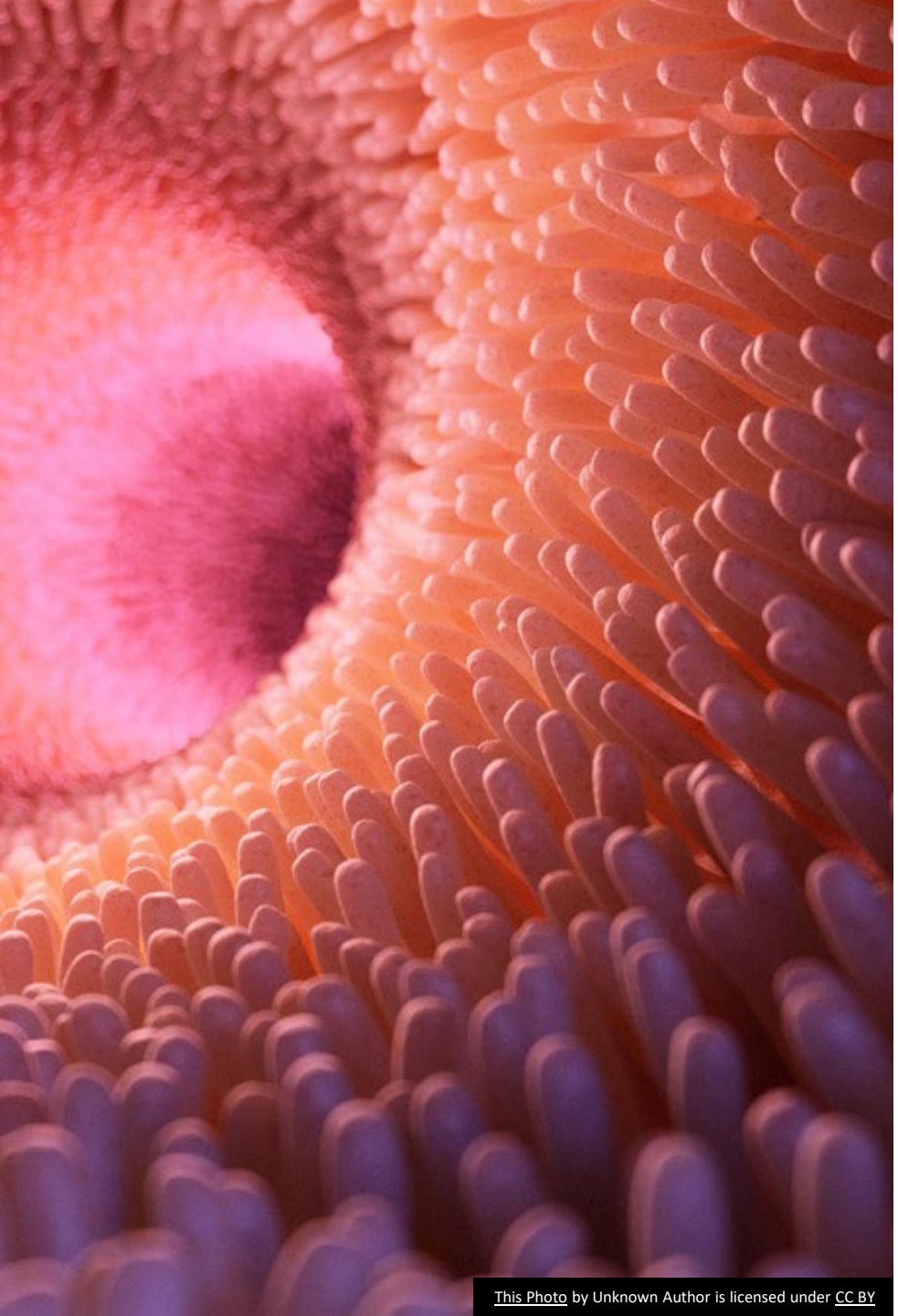
Gastrointestinal disease in cats- signs

Vomiting

Diarrhea

Weight loss

Inappetence



Food Responsive Chronic Enteropathy

Consider one of the most common disorders in senior cats (incidence is increasing)

Definition: Presence of clinical signs for more than 3 weeks with no apparent cause

Age of onset: Food responsive enteropathy- median age 7.7 years; 10.4 years for IBD (Jergens et al 2021)

Most common signs: weight loss> vomiting > diarrhea (compared to dogs: diarrhea)

Diagnostics

Ultrasound- may reveal thickening, loss of layering and thickened muscularis layer

Gastrointestinal panel (cobalamin, folate, TLI and PLI)

- Low cobalamin indicates **distal** small intestinal disease
- Low or increased folate indicates bacterial shifts in the **proximal** small intestine
- Low TLI suggests exocrine pancreatic insufficiency (EPI)
  - Cats often have **decreased** appetite and weight loss with EPI, whereas dogs often have increased appetite, weight loss and diarrhea
  - May occur with chronic pancreatitis
- High PLI supports pancreatitis

Triglycerides (fasted)

- While most cats tolerate dietary fat, high triglycerides is an indication to feed a lower fat diet

Diet trial- how to select a diet

Diet history- critical first step that is often overlooked

Nutrients of concern

- Types of protein
- Consider the caloric distribution of current diet as well as previous diets
- Amount of fiber
- Type of fiber
- Digestibility

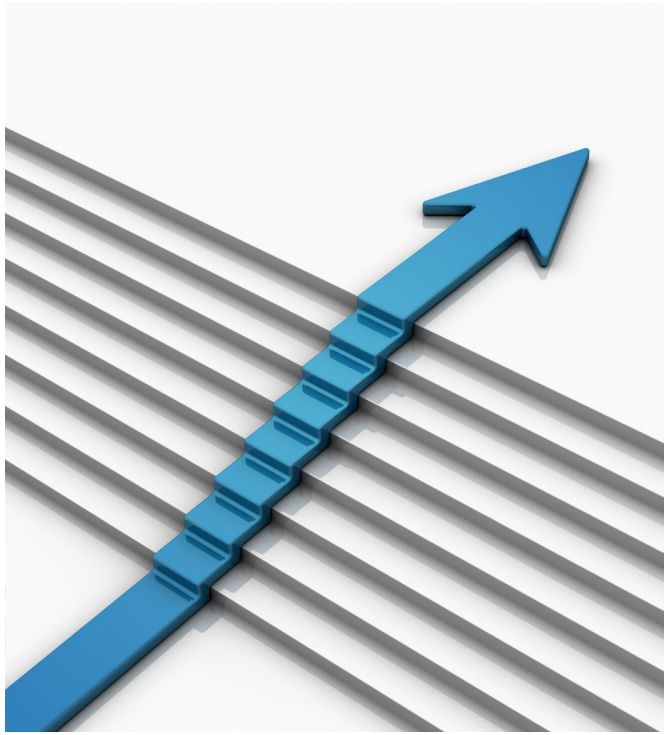
Diet trial- how to select a diet

Try a diet that hasn’t been tried

- Novel or hydrolyzed protein
- Look for a diet with lower fat (if indicated or if they have only been fed high fat diets)
- Look for a different fiber profile (total dietary fiber is best)
- Try a lower carbohydrate diet if they have had diets that were higher in carbohydrates (or vice versa)
- Feed a highly digestible diet

Summary of Steps for Success

1. Diet history
2. Consider nutrients of concern
   - Protein
   - Fat
   - Fiber
   - Digestibility
3. Select a diet that differs from what has been tried
   Type of protein
   Compare nutrients per 100 or 1000 kcal
   Compare caloric distribution
   Compare type and amount of fiber
4. Reevaluate



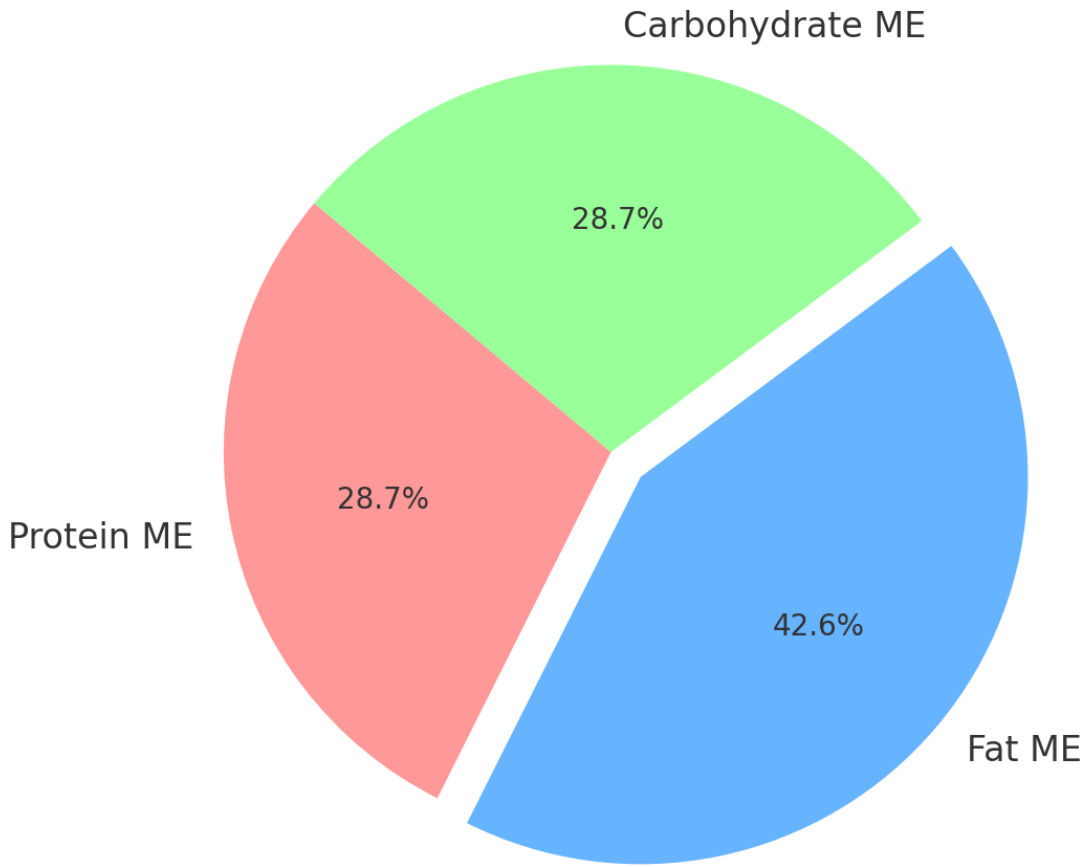
Example- Gracie

Gracie is a 2 year old spayed female Himalayan

Chronic enteropathy - weight loss, vomiting, diarrhea (watery, occasionally soft with mucus)

Diet history:

Hydrolyzed dry cat food
29% protein ME
43% fat ME
29% carbohydrate ME
Total dietary fiber 12 grams per 1000 kcal (1.2 grams/100 kcal)



Caloric distribution of diet

Fast Cat Running Down Stairs | Stable Diffusion Online

Important take away…

CASES DIFFER, STEPS DON’T—FOLLOW THE PROCESS TO FIND THE RIGHT DIET!

Summary

As cats age, their energy needs shift, protein and fat digestibility decline, and they experience musculoskeletal, sensory, and cognitive changes.

Adequate protein intake is important in preventing muscle loss, and muscle condition scoring helps monitor lean body mass.

Cats can tolerate carbohydrate-inclusive diets and high-fat diets are more likely to contribute to obesity and insulin resistance.

Nutritional management of senior cats with and without disease involves taking a stepwise approach to select a diet that will meet their needs, but it always starts with looking at the current diet

Thank you!

Camille Torres
ctorres@colostate.edu

Hill's®
Transforming Lives™

Senior Pet Diets

CAMILLE TORRES-HENDERSON, DVM, DABVP, DACVIM (NUTRITION)

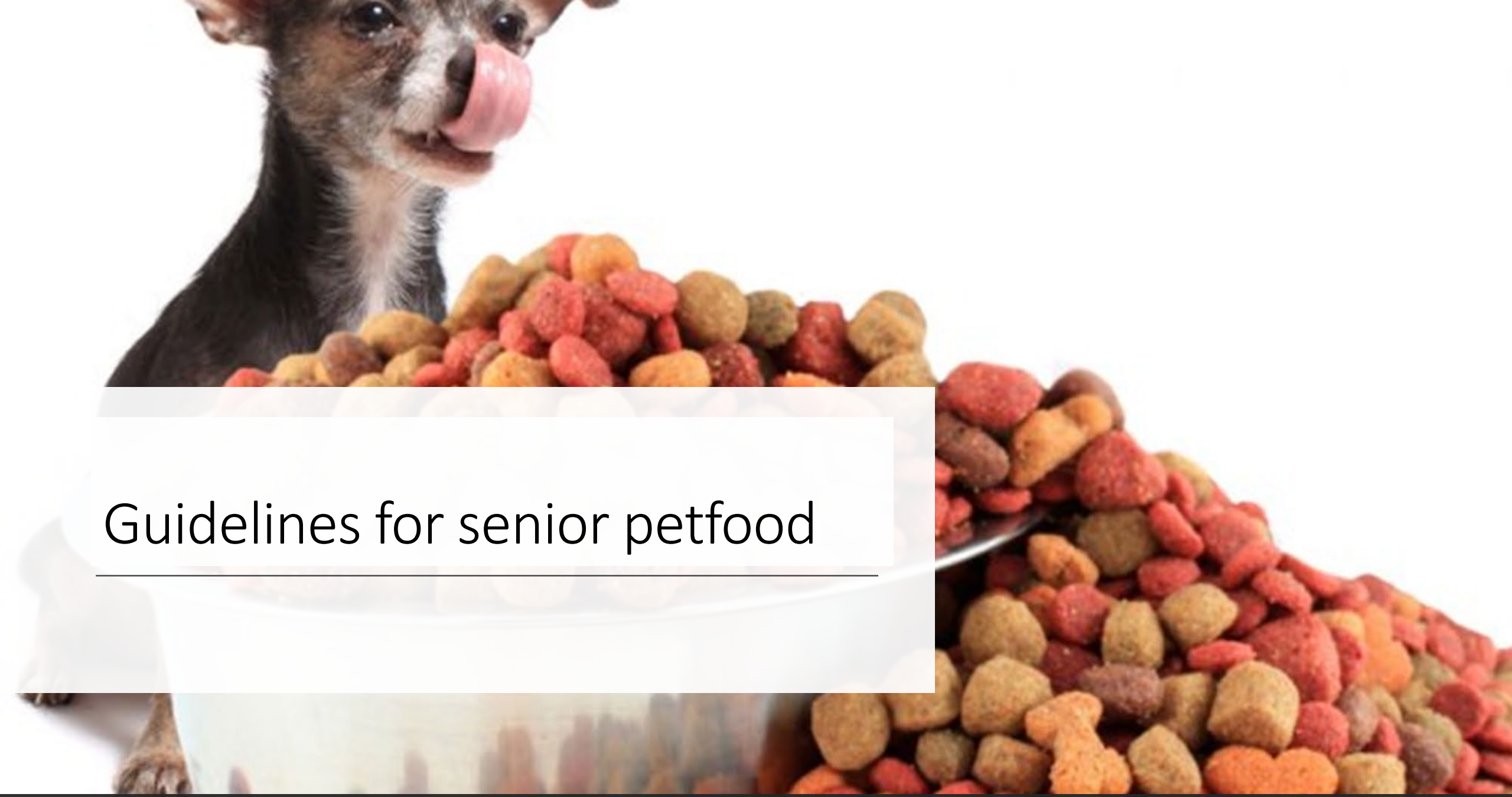
Selecting a Diet for Your Senior Patient

CAMILLE TORRES DVM DABVP DACVIM (NUTRITION)

COLORADO STATE UNIVERSITY

Goals

- Discuss guidelines for senior pet food
- Review how to use the label to select a diet
- Identify diets that meet unique needs



Guidelines for senior petfood

AAFCO Label requirements

Brand and Product Name

Name of Species for which the pet food is intended

Quantity Statement- net weight or net volume

Nutritional Adequacy Statement- Statement that indicates the food is complete and balanced for a particular life stage.

Ingredient Statement- Ingredients must be listed in order of predominance by weight.

Guaranteed Analysis-The minimum percent of crude protein and crude fat, and the maximum percent of crude fiber and moisture are required.

Feeding Directions

Name and address of manufacturer or distributor

Nutritional Adequacy Statement

Maintenance

Growth

Growth for large breed dogs

All Life Stages

Supplemental or intermittent feeding only

AAFCO- Senior pet food

We do not have specific guidelines for senior pet food

Diets labeled as “senior” that are complete and balanced are formulated to meet the requirements of:

- Adult maintenance
- All life stages

All Life Stages:
Nutrients with a higher requirement for growth compared to adult maintenance (AAFCO)

Dogs

- Protein
- Copper
- Fat
- Calcium
- Phosphorus
- EPA/DHA

Cats

- Protein
- Copper
- Calcium
- Phosphorus
- Vitamin A
- EPA/DHA

Nutrients to consider for senior dogs and cats

Digestibility

Palatability

Energy density

Kibble size or texture

Nutrients for illness:

- Protein
- Fat
- Fiber
- Minerals

I want to feed my senior dog and cat the best food that is out there…

Factors to consider when discussing nutrition

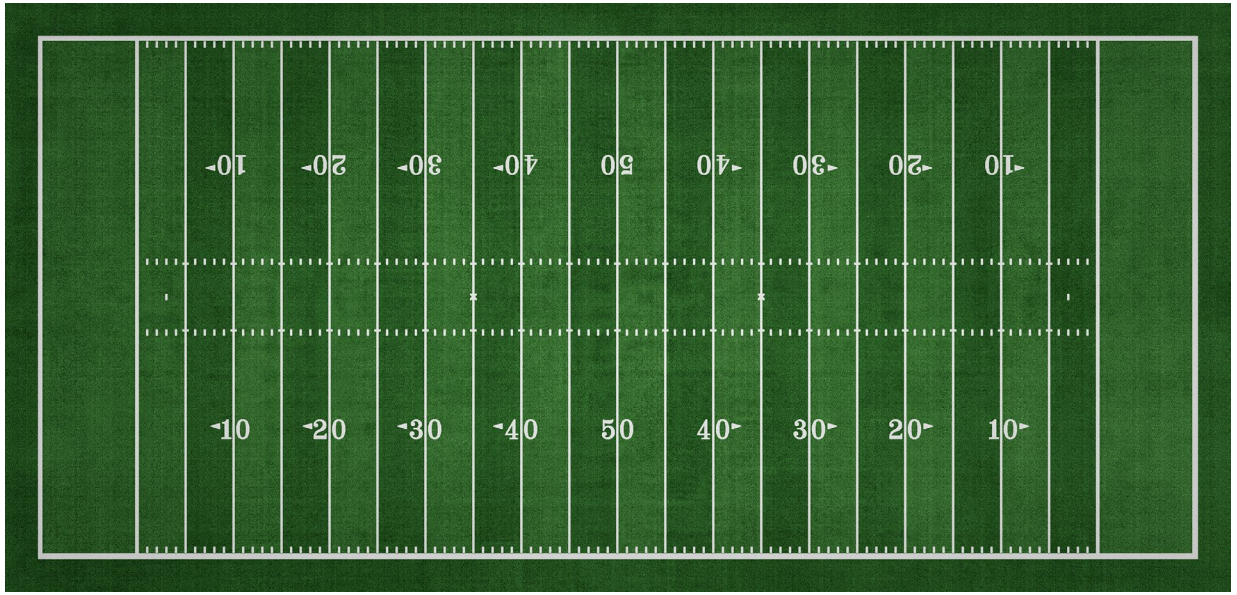
Individual patient need

Limitations

- Financial
- Time
- Family
- Other pets

Emotions

- Build a relationship
- Elicit owners perspective
- Ask for permission
- Check for understanding



Nutrients of concern- gastrointestinal

Condition	Nutrient of Concern	Examples
Pancreatitis- dog	Fat	Limit dietary fat intake, low-fat diets
Chronic Enteropathy	Type of Protein	Hydrolyzed protein, novel protein sources
	Amount of Fat	Low-fat or moderate-fat diets
	Fiber	Soluble fiber sources, such as psyllium or beet pulp
Adverse Reaction to Food	Type of Protein	Novel protein sources, limited ingredient diets

Nutrients of concern- renal

Protein

Digestibility

Phosphorus

Calcium phosphorus ratio

Fat- energy density

Omega 3 fatty acids

How do you select a diet that will meet the nutrient targets for your senior patient with and without illness?

PET FOOD LABEL- FRIEND OR FOE?

Thinking about what our patients need

Cats and dogs are fed to meet their energy requirements

Older patients with decreased energy requirements, will eat less food

This can be problematic when feeding a diet that is high in calories

- Feeding less food to prevent obesity may lead to restriction of nutrients while trying to restrict calories

Diet selection

To make diet recommendations we need to be able to know how the nutrients of a product align with our nutrients of concern

- Protein
- Fat
- Fiber
- Phosphorus (when available)

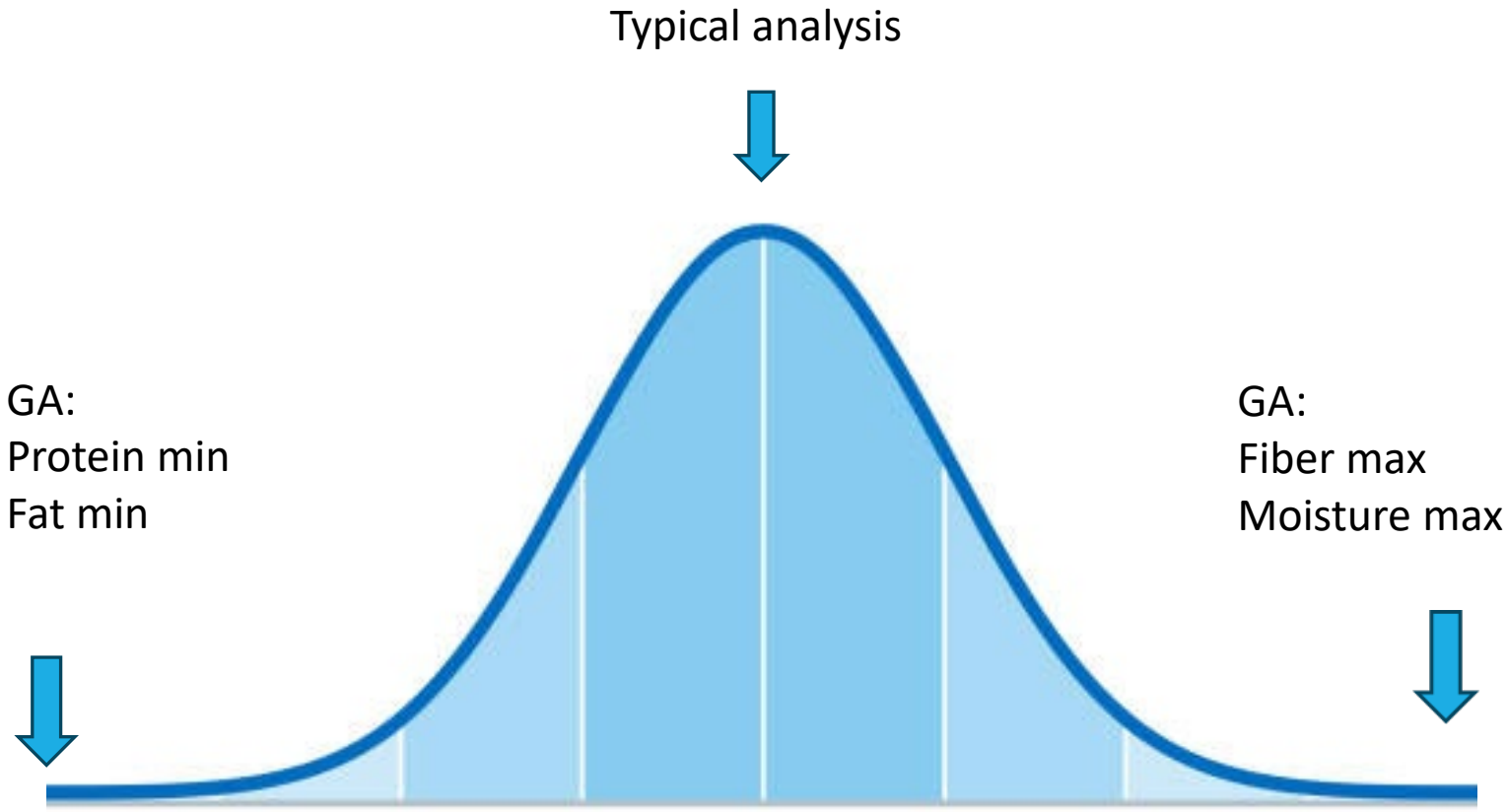
Breaking down "The Back of the Bag"

To make diet recommendations we need to be able to know how if nutrients of a product align with our nutrients of concern

- Crude Fiber
- Crude Fat
- Crude Protein
- Phosphorus

- Types of fiber
- Types of fatty acid

Keep in mind…



The guaranteed analysis represents minimum or maximum nutrient amounts

What is the percent on the guaranteed analysis a percent of?

A) Percent of the nutrient per cup

B) Percent of the nutrient per 1000 calories

C) Percent of the nutrient on a dry matter basis

D) Percent of the nutrient per 100 grams

We feed our patients to meet their caloric needs

Diets do not have the same amount of calories per 100 grams/per cup/per kg

Dog and cats will eat more or less of a diet on a weight basis based on the energy density of the diet

As the amount of food is adjusted on a weight or cup basis, the amount of nutrients consumed will change

Question:

Two diets have 9% crude protein- does that mean they provide the same amount of protein?

How to answer this question

Compare the nutrients on an energy basis

- **Calorie content basis** (g/1000 kcal or g/100 kcal)
- **Metabolizable Energy** (% ME)

Where can you find this information?

First option (preferred option)- look at product guide

Second option- If a product guide isn't available: *Calculate it or convert it*

Calculate it: Calorie content basis

grams/1000 kcal
OR
grams/100 kcal

Typical Analysis per 1000 Kcal:

Nutrient	Unit	Renal Support Early Consult dry	Renal Support Early Consult loaf in sauce	Renal Support A dry	Renal Support F dry	Renal Support S dry
Moisture	g	14.4	766.6	13.9	13.8	13.1
Protein	g	73.2	84.1	58.3	65.1	58.5
Fat	g	36.6	49.5	43.1	42.6	51.3
Omega-6 fatty acids	g	9.1	6.9	9.2	9.0	10.9
Omega-3 fatty acids	g	3.5	2.5	1.9	2.1	2.1
EPA + DHA	g	2.0	1.7	1.0	1.0	1.0
Carbohydrate (NFE)	g	109.5	68.2	113.1	105.1	93.3
Crude Fiber	g	11.5	7.9	10.9	9.0	7.2
Total Dietary Fiber	g	33.2	19.8	27.1	26.8	23.9
Calcium	g	1.8	1.6	2.1	1.6	1.7
Phosphorus	g	1.3	1.2	1.1	1.1	1.0
Potassium	g	2.1	1.8	2.3	2.3	2.1
Sodium	g	1.0	0.9	0.9	1.0	1.0
Magnesium	g	0.2	0.1	0.2	0.2	0.2
Copper	mg	3.9	3.1	3.8	3.8	3.6
Zinc	mg	55.9	53.4	60.1	52.6	49.7
Vitamin D	IU	209.1	178.0	202.8	225.3	167.1
Taurine	g	0.5	1.2	0.6	0.6	0.6

ROYAL CANIN® VETERINARY HEALTH NUTRITION

FELINE VITAL SUPPORT

Grams of nutrients per 1000 kcal

	per 100 kcal ME³						
	k/d Early Stage Cat Food		k/d Cat Food				
	Dry (with Chicken)	Stew (Chicken, Vegetable & Rice)	Dry (with Chicken)	Dry (with Ocean Fish)	Stew (Chicken & Vegetable)	Stew (Vegetable & Tuna)	Minced (with Chicken)
Protein	7.9 g	7.6 g	6.7 g	6.8 g	6.8 g	7.6 g	6.8 g
Fat	4.9 g	5.3 g	5.4 g	5.4 g	5.6 g	6.5 g	5.3 g
Carbohydrate / NFE	8.9 g	7.9 g	8.7 g	8.6 g	8.7 g	9.1 g	9 g
Crude Fiber	0.3 g	0.6 g	0.7 g	0.7 g	0.7 g	0.7 g	0.5 g
Total Dietary Fiber	1.4 g	1.7 g	1.6 g	1.5 g	2 g	2.1 g	1.1 g
Calcium	167 mg	193 mg	183 mg	182 mg	173 mg	213 mg	192 mg
Phosphorous	130 mg	130 mg	119 mg	120 mg	110 mg	127 mg	110 mg
Sodium	58 mg	64 mg	57 mg	61 mg	57 mg	61 mg	59 mg
Potassium	174 mg	210 mg	171 mg	171 mg	250 mg	304 mg	253 mg
Magnesium	19 mg	13 mg	18 mg	17 mg	13 mg	15 mg	12 mg
Total Omega-3 FA	377 mg	288 mg	244 mg	255 mg	258 mg	305 mg	237 mg
Total Omega-6 FA	1089 mg	827 mg	1212 mg	1181 mg	925 mg	1150 mg	870 mg
Vitamin C	3.17 mg	8.79 mg	2.47 mg	2.45 mg	3.4 mg	3.47 mg	2.18 mg
Vitamin E	26 IU	17.71 IU	18.79 IU	18.7 IU	17.05 IU	23.64 IU	22.77 IU
CALORIC DISTRIBUTION:							
Fat %	41	46	46	46	47	49	45
Protein %	28	27	24	24	23	23	24
Carbohydrates %	31	28	31	30	30	28	31
Metabolizable Energy:							
kcal per Cup	526		534	506			
Ounces per Cup	4.5		4.5	4.3			
Cups per Pound	3.52		3.52	3.74			
kcal per 5.5 oz Can							195
kcal per 2.9 oz Can		79			70	70	

Grams of nutrient per 100 kcal

Back to the question:
Do they have the same amount of protein?

Crude Protein	9.0% min
Crude Fat	2.5% min
Crude Fiber	1.0% max
Moisture	82.0% max
Ash	2.5% max
Taurine	0.05% min

Diet A: 825 kcal/kg

Analysis:

Protein	9.0% Min
Fat	1.5% Min
Fiber	1.0% Max
Ash	2.0% Max
Moisture	86.0% Max

Diet B 1100 kcal per kg

Calculate estimated grams of protein per 100 kcal

Information needed

- Calories per kg
- % crude protein

Equation: (Nutrient on GA ÷ kcal per kg) X 1000 = grams of nutrient per 100 kcal

(Crude protein/calories per kg) X 1000 = grams of protein per 100 kcal

Crude Protein	9.0% min
Crude Fat	2.5% min
Crude Fiber	1.0% max
Moisture	82.0% max
Ash	2.5% max
Taurine	0.05% min

825 Calories per kg

Analysis:

Protein	9.0% Min
Fat	1.5% Min
Fiber	1.0% Max
Ash	2.0% Max
Moisture	86.0% Max

Diet B 1100 kcal per kg

Math time

Crude protein 9%

Diet A 825 Calories per kg OR Diet B 1100 kcal per kg

(9/825) = 0.0109

0.0104 X 1000 = Diet A 10.9 grams of protein per 100 calories

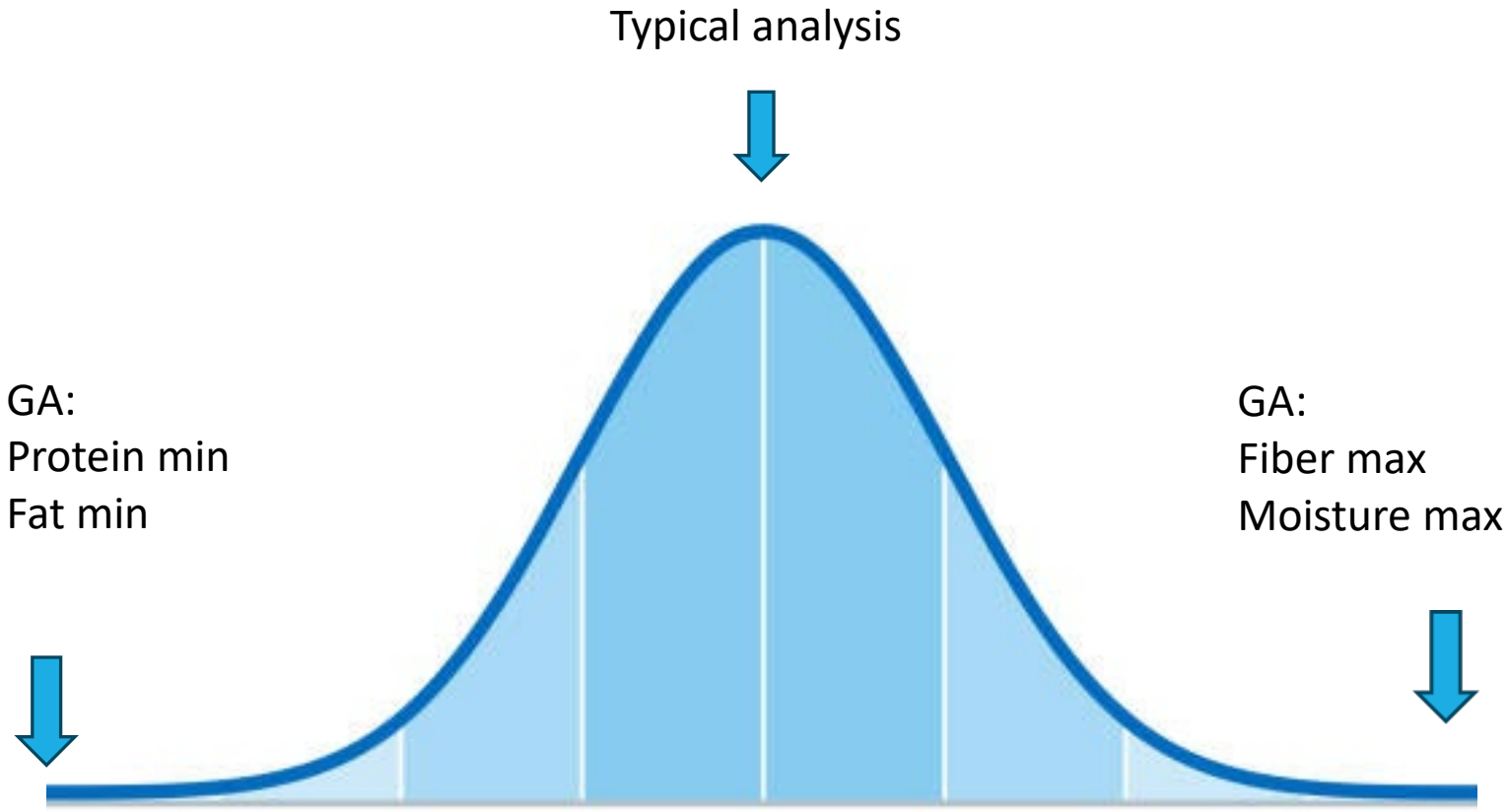
0.0104 X 10000 = 109 grams/1000 calories

(9/1100) = 0.0082

0.0082 X 1000 = Diet B 8.2 grams of protein per 100 calories

0.0082 X 10000 = 82 grams/1000 calories

But remember…



The guaranteed analysis represents minimum or maximum nutrient amounts

AVERAGE NUTRIENT CONTENT

	DRY			CANNED		
	PER 100 KCAL ME	AS FED	DRY MATTER	PER 100 KCAL ME	AS FED	DRY MATTER
Protein	8.99 g	36.32%	39.07%	9.45 g	9.64%	37.79%
Fat	3.59 g	14.52%	15.62%	4.38 g	4.47%	17.53%
Carbohydrate	8.24 g	33.29%	35.81%	8.32 g	8.49%	33.28%
Crude Fiber	0.72 g	2.90%	3.12%	1.94 g	1.98%	7.76%
Total Dietary Fiber	2.75 g	11.10%	11.94%	3.46 g	3.53%	13.84%
Soluble Fiber	0.35 g	1.41%	1.52%	0.54 g	0.55%	2.16%
Insoluble Fiber	2.40 g	9.69%	10.42%	2.92 g	2.98%	11.69%
Calcium	0.17 g	0.67%	0.72%	0.18 g	0.18%	0.72%
Phosphorus	0.09 g	0.37%	0.40%	0.10 g	0.10%	0.39%
Potassium	0.35 g	1.40%	1.51%	0.38 g	0.39%	1.54%
Sodium	0.09 g	0.36%	0.39%	0.09 g	0.10%	0.38%
Chloride	0.32 g	1.30%	1.40%	0.43 g	0.44%	1.72%
Magnesium	0.02 g	0.10%	0.11%	0.01 g	0.01%	0.04%
Copper	0.41 mg	16.66 mg/kg	17.92 mg/kg	0.33 mg	3.39 mg/kg	13.30 mg/kg
Zinc	5.39 mg	217.90 mg/kg	234.40 mg/kg	2.62 mg	26.68 mg/kg	104.61 mg/kg
Taurine	0.05 g	0.22%	0.24%	0.07 g	0.07%	0.29%
Vitamin A	267 IU	10,803 IU/kg	11,621 IU/kg	2,241 IU	22,858 IU/kg	89,640 IU/kg
Vitamin E	16.44 IU	664.20 IU/kg	714.50 IU/kg	17.54 IU	178.92 IU/kg	701.66 IU/kg
Total Omega-6 Fatty Acids	0.36 g	1.47%	1.58%	0.82 g	0.84%	3.27%
Total Omega-3 Fatty Acids	0.13 g	0.54%	0.58%	0.15 g	0.15%	0.61%
EPA+DHA	0.10 g	0.42%	0.45%	0.11 g	0.11%	0.45%

DIGESTION TEST RESULTS†

DIGESTIBILITY:	DRY	CANNED
Total, %	87.6	83.5
Protein, %	92.8	86.6
Fat, %	90.5	93.2
Carbohydrate, %	89.4	89.6
Calorie, %	89.4	85.9
PERCENTAGE OF METABOLIZABLE ENERGY FROM:		
Protein, %	34.6	33.3
Fat, %	33.6	37.5
Carbohydrate, %	31.8	29.3

†Based on digestion testing conducted at the Purina PetCare Technology Centers

1 Adjustments must be made for environmental conditions, activity level, and body condition. Provide fresh water in a clean container daily.

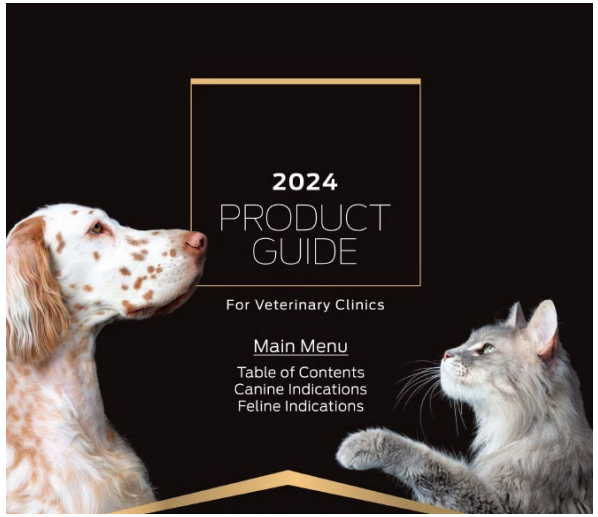
2 Kilocalories of metabolizable energy (ME)

3 This daily amount should be divided into several small meals throughout the day.

4 For each additional pound of body weight, feed an additional 24 kilocalories.

5 Forrester SD, Kruger JM, Allen TA. Feline Lower Urinary Tract Diseases. In: Hand MS, Thatcher CD, Remillard RL, Roudebush P, editors. Small Animal Clinical Nutrition. 5th ed. Topeka (KS): Mark Morris Institute; 2010 p.932.

Preference: Use the product guide when available



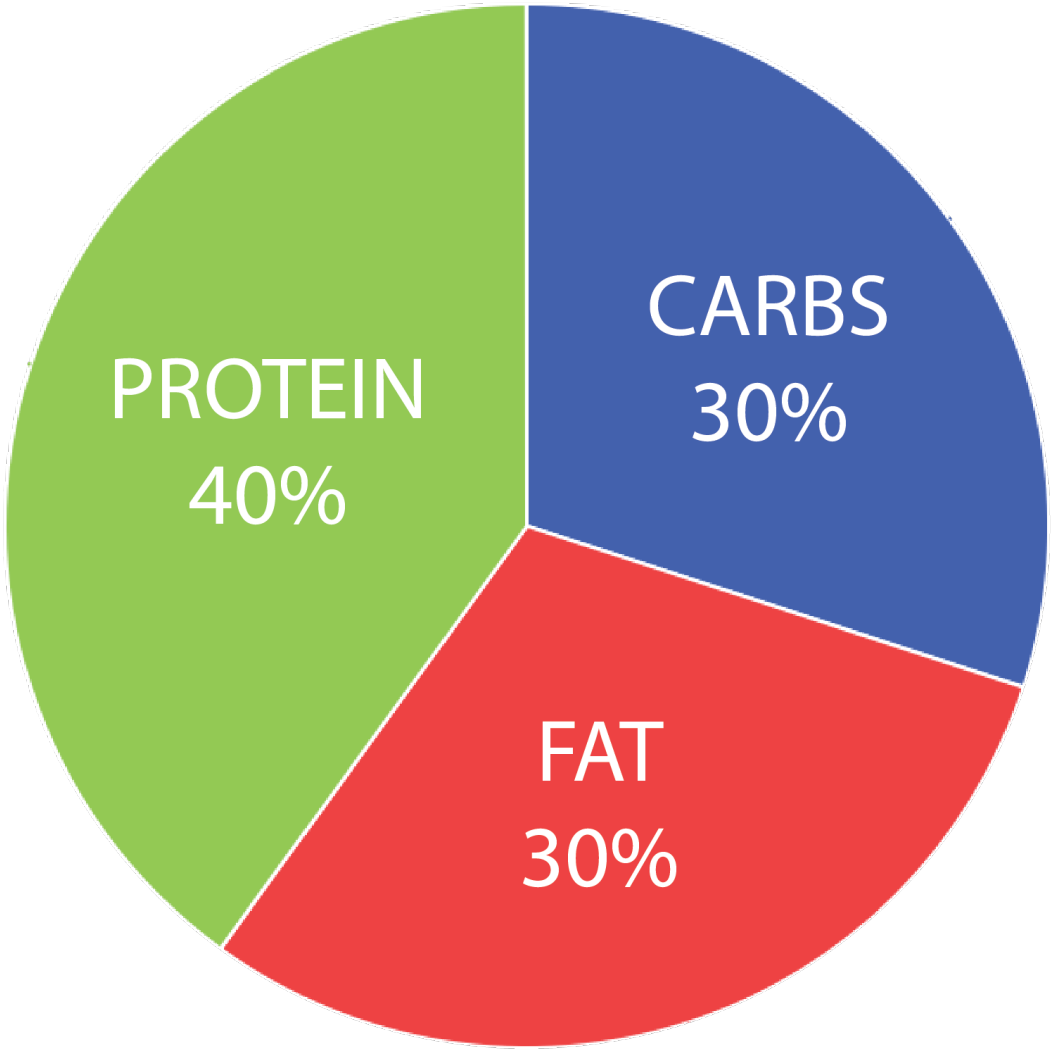
Convert it:

Percent metabolizable energy

%ME

Caloric distribution

The percent of calories coming from that macronutrient



Nutrient	Modified Atwater Factor
Protein	3.5 kcal/g
Fat	8.5 kcal/g
Carbohydrate	3.5 kcal/g

Modified Atwater Factors

Used to estimate how many calories are coming from protein, fat and carbohydrates

Izzy- 14 year old, spayed female, Welsh Corgi

Age related changes

- Osteoarthritis
- Cognitive dysfunction
- Decreased ability to prehend food
- Hearing loss
- Decreased lean body mass

Disease related changes

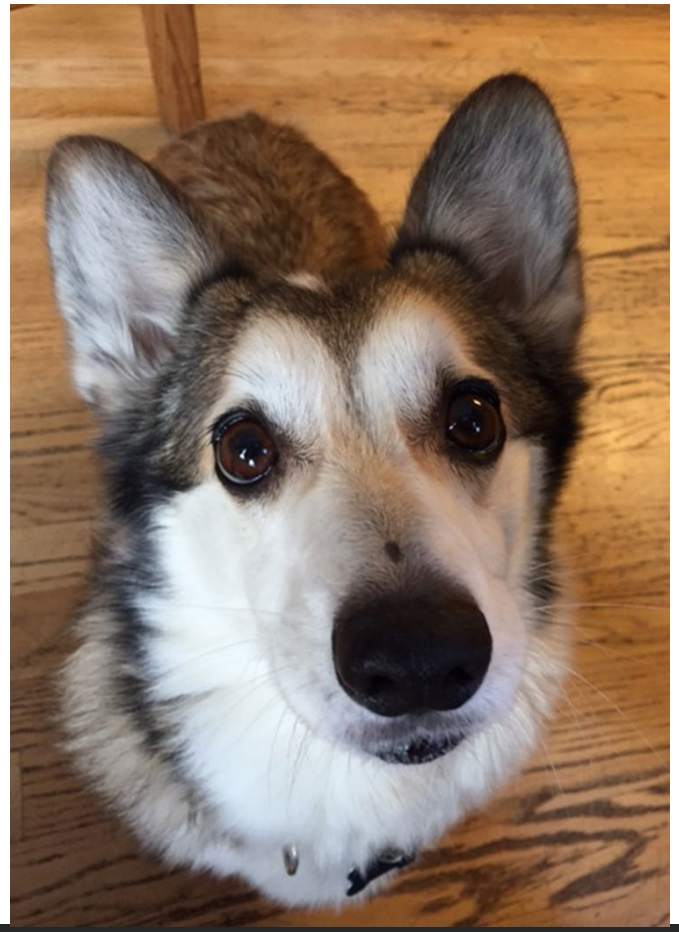
- Proteinuria (UPC- 2.3)
- Renal azotemia (BUN- 63, Creat- 2.3; USG- 1.022)
- Intermittent gastrointestinal signs, suspect chronic pancreatitis

Nutrients of concern for Izzy

Disease	Protein	Omega-3 Fatty Acids	Phosphorus	Digestibility	Fat	Energy Density	Palatability
Proteinuria	Low	Yes	Controlled?				
Renal Dysfunction	Low	Yes	Low	High	High	High	High
Gastrointestinal Disease/ Pancreatitis	Type of protein			High	Low	High	High
Underweight	Moderate to high	Yes		High	High	High	High
Muscle Loss (Cachexia)	High	Yes		High	High	High	High

Izzy’s diet- Always start with the current diet

Guaranteed Analysis	
Crude Protein % min	16%
Crude Fat % min	6%
Crude Fiber % max	1%
Moisture % max	66%



% Metabolizable Energy also called Caloric Distribution

	per 100 kcal ME³					
	k/d Dog Food					
	Dry (with Chicken)	Dry (with Lamb)	Stew (Chicken & Vegetable)	Stew (Beef & Vegetable)	Loaf (with Chicken)	Loaf (with Lamb)
Protein	3.6 g	3.6 g	3.7 g	3.6 g	3.6 g	3.5 g
Fat	4.9 g	5.1 g	5.3 g	5.4 g	5.8 g	5.8 g
Carbohydrate / NFE	13.1 g	12.6 g	11.9 g	11.8 g	10.9 g	11 g
Crude Fiber	0.3 g	0.4 g	0.8 g	0.8 g	0.9 g	0.9 g
Total Dietary Fiber	1.3 g	1.6 g	2.2 g	2.2 g	2 g	1.8 g
Calcium	184 mg	198 mg	173 mg	175 mg	166 mg	184 mg
Phosphorous	75 mg	76 mg	71 mg	61 mg	55 mg	61 mg
Sodium	41 mg	46 mg	45 mg	40 mg	46 mg	40 mg
Potassium	174 mg	190 mg	225 mg	233 mg	193 mg	199 mg
Magnesium	25 mg	27 mg	35 mg	32 mg	33 mg	32 mg
Total Omega-3 FA	215 mg	219 mg	294 mg	306 mg	567 mg	511 mg
Total Omega-6 FA	1032 mg	1016 mg	864 mg	846 mg	897 mg	854 mg
Vitamin C	3.35 mg	3.36 mg	4.11 mg	3.93 mg	3.18 mg	2.29 mg
Vitamin E	16.77 IU	16.78 IU	22.16 IU	20.15 IU	16.2 IU	18.29 IU
CALORIC DISTRIBUTION:						
Fat %	42	43	45	46	49	49
Protein %	12	13	13	13	12	12
Carbohydrates %	46	44	42	42	38	38
Metabolizable Energy:						
Kcal per Cup	397	454				
Ounces per Cup	3.5	4				
Cups per Pound	4.6	3.99				
Kcal per large Can			344 / 12.5 oz	329 / 12.5 oz	433 / 13 oz	421 / 13 oz
Kcal per 5.5 oz Can			152			

Guaranteed Analysis Converter

It can be difficult to compare the protein, fat and carb levels between different foods by using the information on a package's label (especially in can vs dry food).

Note: the calculated values may be different from those used by the manufacturer since the actual digestibility of protein, fat, carb and ash must be estimated. Minimum values can also differ from the typical or actual value—so care should be used as protein and fat levels may be higher than the label indicates.

Guaranteed Analysis Values			Caloric Distribution Estimate*
% Crude Protein, min	0	%	0 % ME Protein
% Crude Fat, min	0	%	0 % ME Fat
% Moisture, max	0	%	
% Fiber, max	0	%	
% Ash, max	3	%	
% CHO (by difference)	97	%	100 % ME Carb

Calcium	184 mg	198 mg	173 mg	175 mg
Phosphorous	75 mg	76 mg	71 mg	61 mg
Sodium	41 mg	46 mg	45 mg	40 mg
Potassium	174 mg	190 mg	225 mg	233 mg
Magnesium	25 mg	27 mg	35 mg	32 mg
Total Omega-3 FA	215 mg	219 mg	294 mg	306 mg
Total Omega-6 FA	1032 mg	1016 mg	864 mg	846 mg
Vitamin C	3.35 mg	3.36 mg	4.11 mg	3.93 mg
Vitamin E	16.77 IU	16.78 IU	22.16 IU	20.15 IU
CALORIC DISTRIBUTION:				
Fat %	42	43	45	46
Protein %	12	13	13	13
Carbohydrates %	46	44	42	42
Metabolizable Energy:				
Kcal per Cup		454		
Ounces per Cup		4		
Cups per Pound	4.6	3.99		

Guaranteed Analysis

Crude Protein % min	16%
Crude Fat % min	6%
Crude Fiber % max	1%
Moisture % max	66%

Guaranteed Analysis Values

% Crude Protein, min	16	%
% Crude Fat, min	6	%
% Moisture, max	66	%
% Fiber, max	1	%
% Ash, max	3	%
% CHO (by difference)	8	%

* The following "modified Atwater" factors are used: 3.5 kcal/g protein, 8.5 kcal/g fat, and 3.5 kcal/g carbohydrate.

CALCULATE

Guaranteed analysis converter: BalanceIT.com

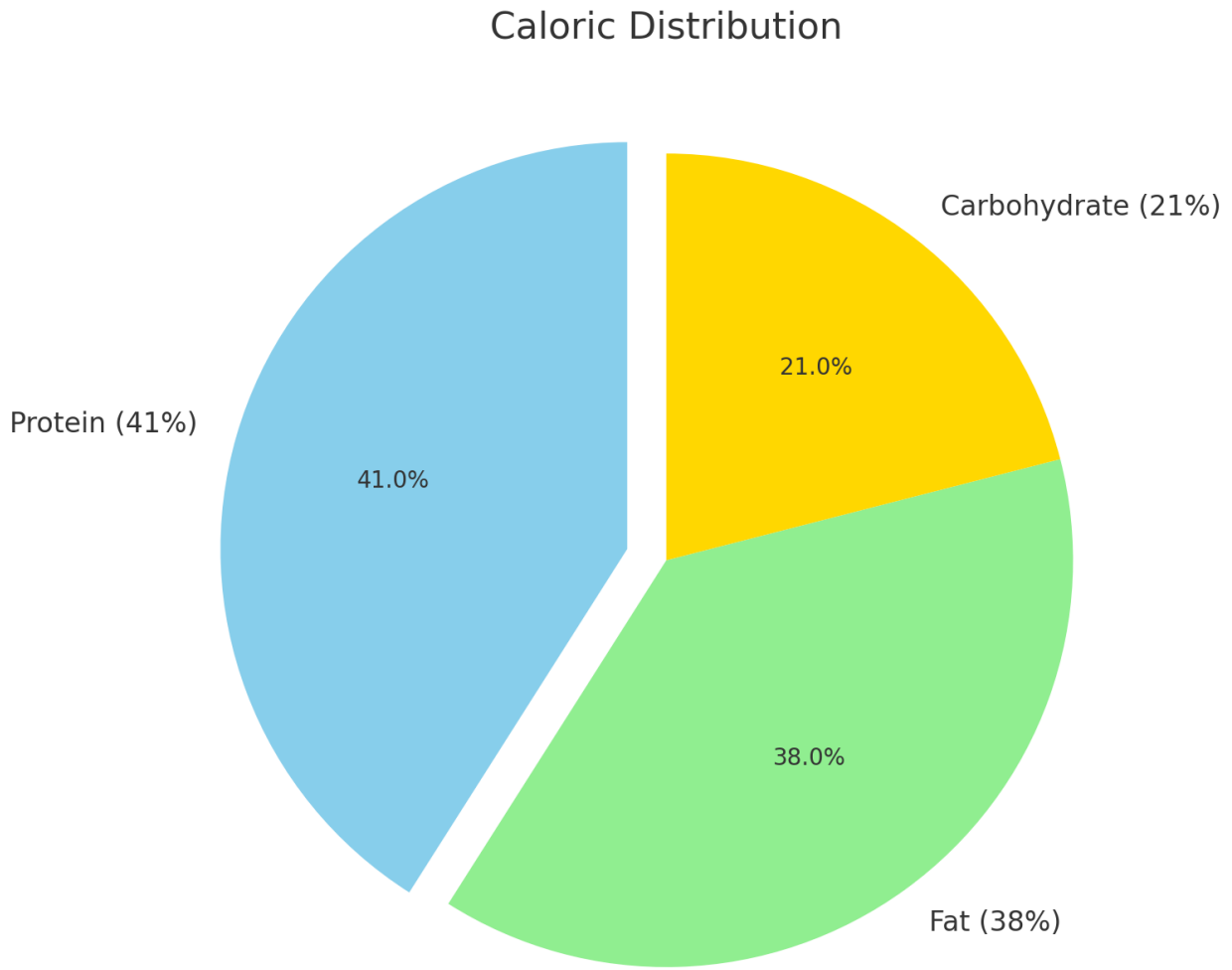
Caloric distribution of Izzy's diet

Goals for renal disease

- Low protein:
  - 13-15% Protein ME

Goals for pancreatitis

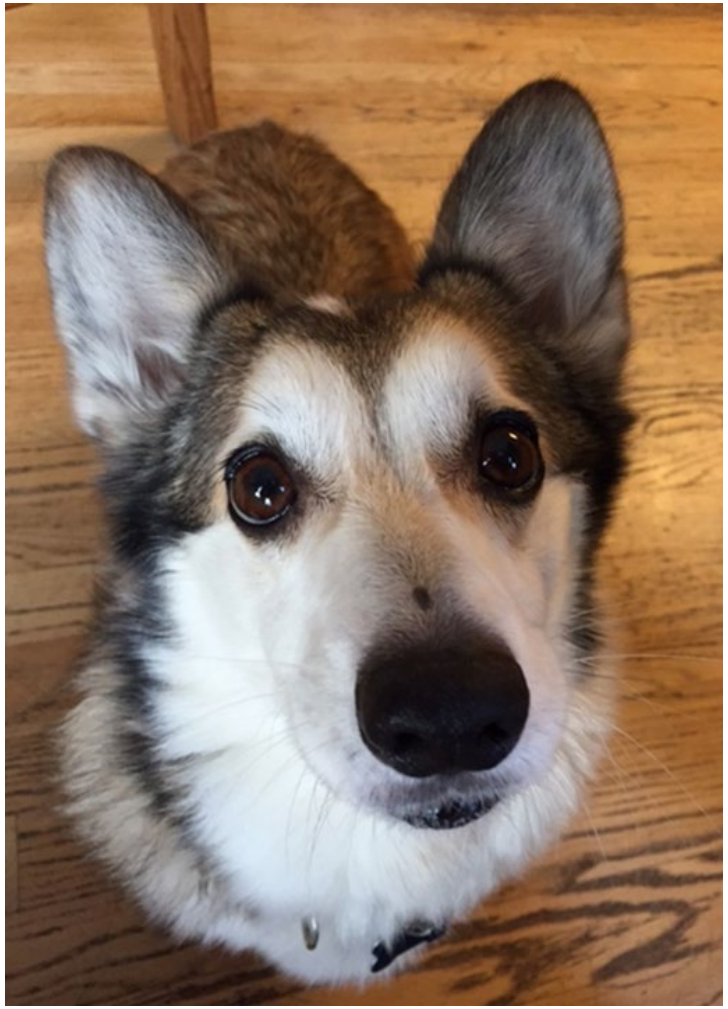
- Low fat:
- <20% Fat ME



Concerns with Izzy's current diet

Higher in protein than recommended for renal disease

Higher in fat than recommended for fat intolerance (GI or pancreatitis)



Protein- Dog % Metabolizable Energy and Grams/1000 kcal

DOG	PROTEIN RANGE (% ME)	GRAM PROTEIN PER 1000 KCAL
Low Protein	<15%	<37g
Moderate Protein	20-30%	50 -75g
High Protein	40-60%	>90 g

Protein- Cat
% Metabolizable Energy and Grams/1000 kcal

Cat	Protein Range (% ME)	Gram Protein per 1000 kcal
Low Protein	<26%	47-75g
High Protein	40-60%	>90 g

Fat- Dogs
% Metabolizable Energy and Grams/1000 kcal

	FAT RANGE (% ME)	GRAM PER 1000 KCAL
Low Fat	<20%	<26 g
Moderate Fat	25-35%	27- 45 g
High Fat	40-60%	45 – 60 g

Common comorbidity challenge in dogs

Need for limited ingredient or hydrolyzed protein

AND

Need low fat

Solution:

18% > 20% >22% > 24% (fat ME)

Challenge:

What if you need more **fiber**

Solution: Limited ingredient or hydrolyzed canine diets that have more fiber but still lower in fat

Dog food	Total dietary fiber g/1000 kcal	Fat grams/1000 kcal
Royal Canin Hydrolyzed Protein canned	57	41
Purina HA Chicken Flavor canned	48	33
Royal Canin Selected Protein PW Moderate Calorie dry	47	30
Royal Canin Vegetarian dry	32	28
Hill's z/d Low Fat canned	27	25
Hill's z/d Low Fat dry	26	21

Common challenge in cats: Renal disease and gastrointestinal disease

Need low protein for renal disease:

- <75 g/1000 kcal

Need low phosphorus for renal disease:

- 0.8-1.3 g/1000 kcal

Novel or hydrolyzed protein

Feline Diet	Protein type	Protein g/1000 kcal	Phosphorus g/1000 kcal
Royal Canin Renal Support Hydrolyzed Protein	hydrolyzed soy	63	1.1
Royal Canin Hydrolyzed Protein	hydrolyzed soy	63	1.5
Royal Canin Ultamino	hydrolyzed poultry by-products	63	1.3
Hill's z/d canned	hydrolyzed chicken liver	88	1.6
Hill's z/d dry	hydrolyzed chicken liver	83	1.6

Solution: Gastrointestinal diets that are lower in protein and phosphorus

Low protein cats:
<75 g/1000 kcal
Phosphorus for renal disease:
0.8-1.3 g/1000 kcal

Summary

Senior dogs and cats can benefit from an individualized diet plan

Selecting a diet starts with knowing what the nutrient profile is of the current diet

By using product guides or converting the numbers on the label to an energy basis we can compare diets to our nutrients of concern

In cases of comorbidities there are several diets that can meet the needs of our patients

Thank you!

CAMILLE TORRES DVM
DABVP CANINE FELINE
DACVIM NUTRITION

CTORRES@COLOSTATE.EDU

Hill's®
Transforming Lives™

Weighty Matters: Tackling Canine and Feline Obesity In Senior Pets – Insights from the Healthy Weight Clinic and Pet Health Center

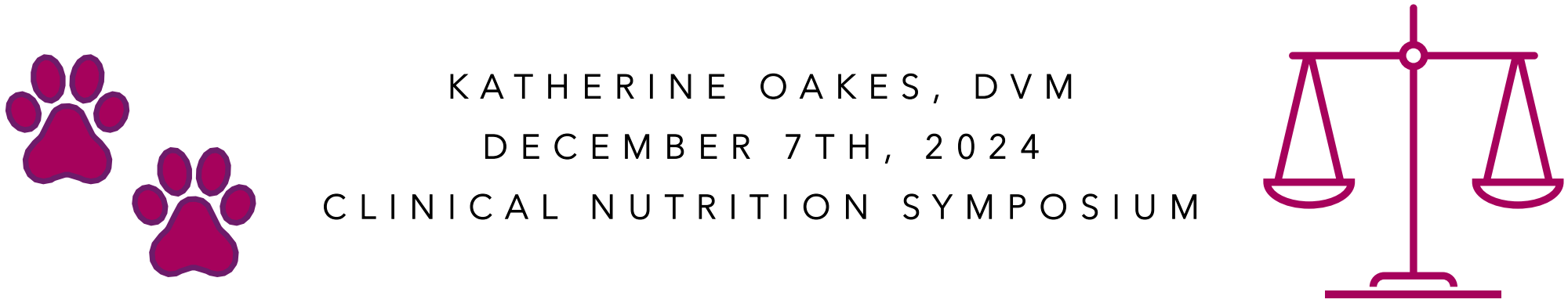
KATHERINE OAKES, DVM

WEIGHTY MATTERS: TACKLING CANINE & FELINE OBESITY IN SENIOR PETS

KATHERINE OAKES, DVM

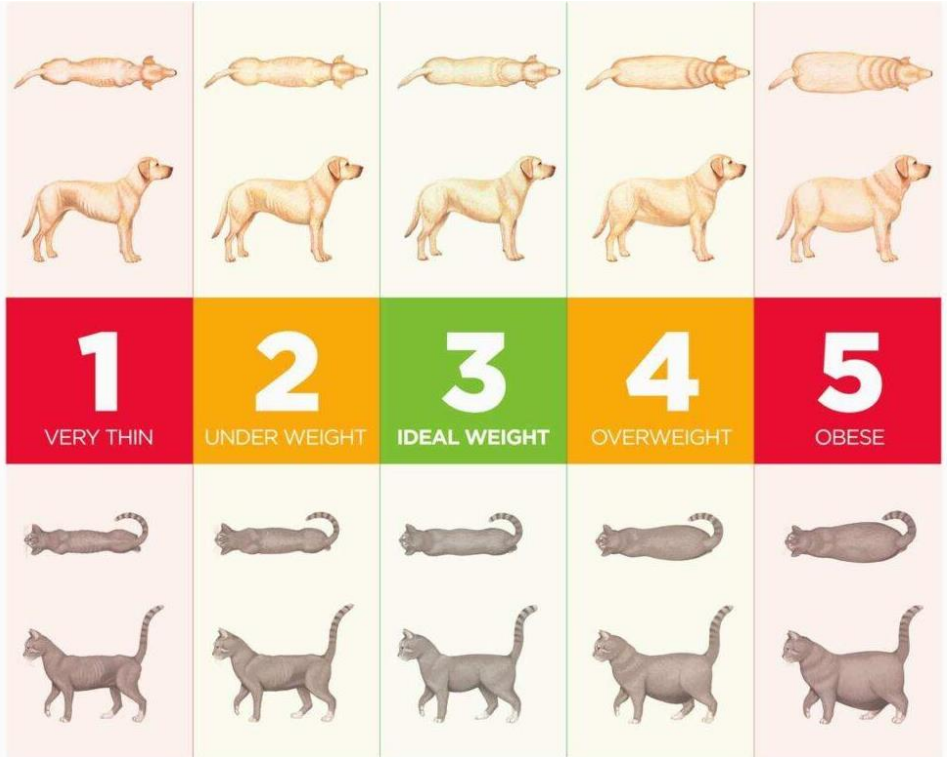
DECEMBER 7TH, 2024

CLINICAL NUTRITION SYMPOSIUM



DEFINITIONS

- Obesity: excess white adipose tissue (body fat) that contributes to disease
- BCS: diagnosed via physical examination
  - 1-5 or 1-9
  - Evaluation of subQ fat

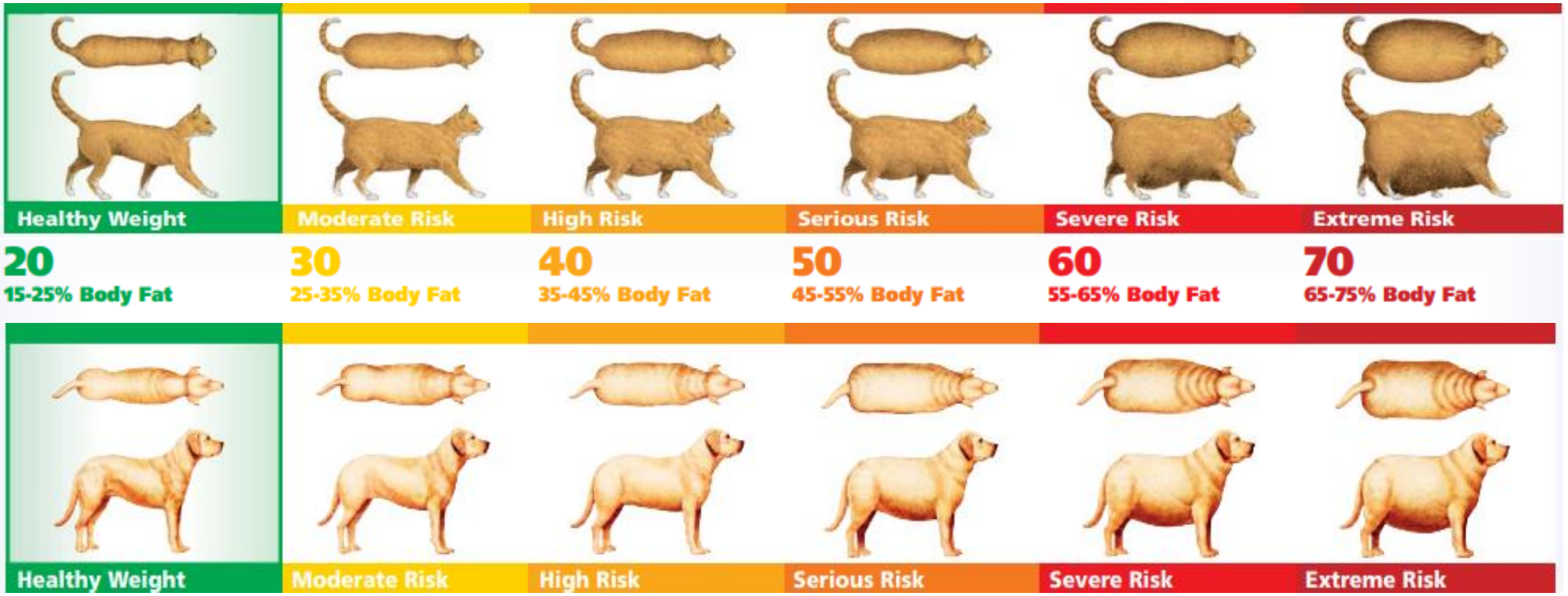


Salt, et. al (2018); Laflamme, et. al (2012); Chiang, et al (2022); Hill's Pet Nutrition

BODY CONDITION SCORE

Association for Pet Obesity Prevention

BODY FAT INDEX (BFI) RISK CHART



Hill's Pet Nutrition

DEFINITIONS

AAFP-AAHA Feline Lifestage Guidelines (2021)

DEFINITIONS

Table 2. The 14 breeds with the highest median age at death (>13.5 years) showing the Kennel Club breed group that these breeds belong to, the published values for average "ideal" bodyweight (Alderton, 1993), number of deaths in each breed and median age at death

Breed group	Breed	Average bodyweight (kg)	Median age at death (year)	Number of deaths
Small	Lakeland terrier	5·5	15·46	14
Small	Irish terrier	11·5	14·83	2
Medium	Canaan dog	20·5	14·63	2
Toy	Toy poodle	5·0	14·63	20
Small	Swedish vallhund	13·0	14·42	17
Small	Tibetan spaniel	5·5	14·42	125
Small	Lhasa apso	6·5	14·33	84
Toy	Australian silky terrier	4·5	14·25	5
Small	Border terrier	6·0	14·00	177
Small	Cairn terrier	7·0	14·00	124
Small	Miniature poodle	13·0	13·92	23
Small	Basenji	10·0	13·54	46
Medium	Bearded collie	22·5	13·50	278
Toy	Italian greyhound	4·0	13·50	46

Table 3. The 11 breeds with the lowest median age at death (<8 years) showing the Kennel Club breed group that these breeds belong to, the published values for average "ideal" bodyweight (Alderton, 1993), number of deaths in each breed and median age at death

Breed group	Breed	Average bodyweight (kg)	Median age at death (year)	Number of deaths
Large	Bullmastiff	50·0	7·46	96
Giant	Leonberger	42·0	7·08	47
Giant	Irish wolfhound	47·5	7·04	112
Giant	St Bernard	70·0	7·00	53
Small	Shiba Inu (Japanese)	11·5	7·00	3
Giant	Mastiff	83·0	6·83	80
Giant	Bloodhound	43·0	6·79	82
Giant	Great Dane	50·0	6·50	171
Medium	Bulldog	24·0	6·29	180
Medium	Shar pei	18·0	6·29	60
Large	Dogue de Bordeaux	47·5	3·83	5

Adams, et al (2010)

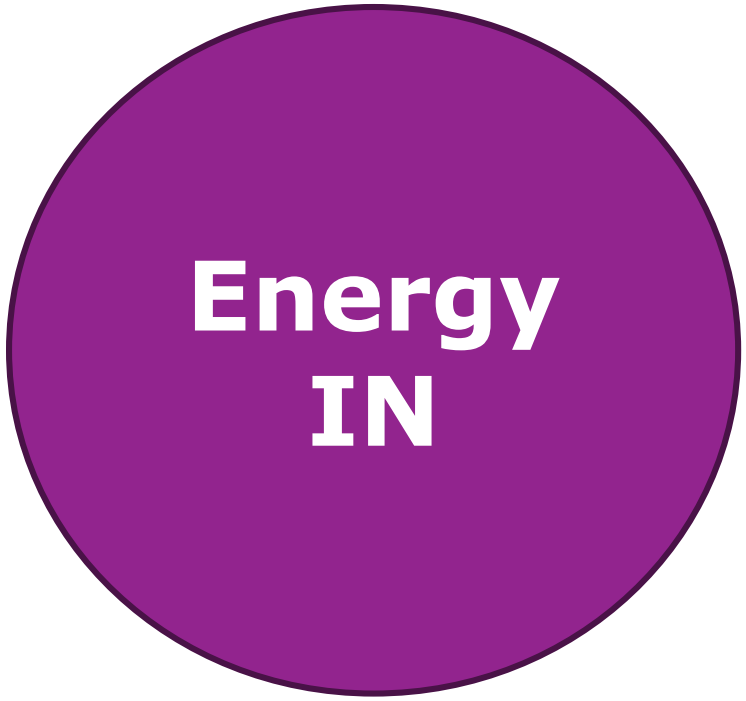
The Institute of Canine Biology

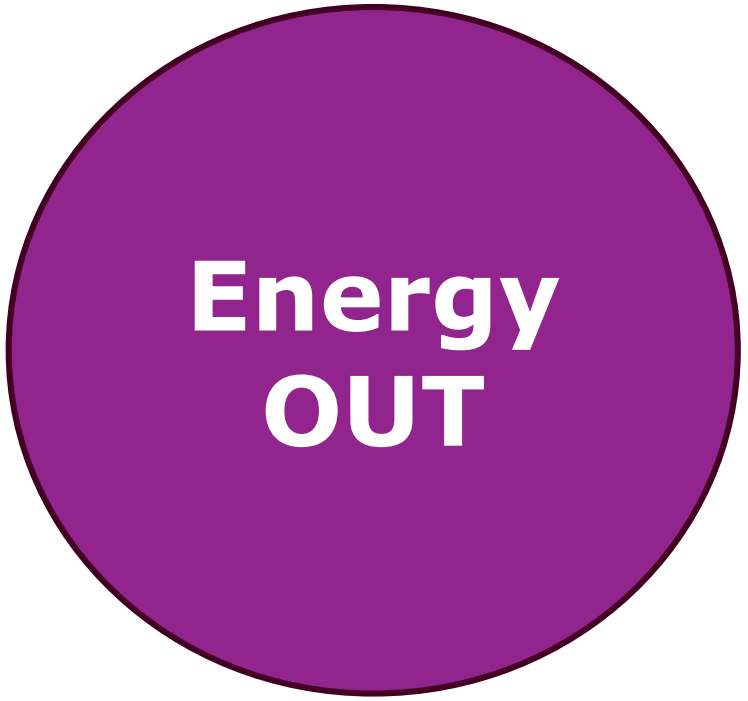
PREVALENCE

Most common form of malnutrition

Association for Pet Obesity Prevention (2022); Blanchard, et. al (2024); Buffington (2014)

PATHOPHYSIOLOGY





PATHOPHYSIOLOGY

- **Overall: EXCESS CALORIES**
  - Over-feeding
  - Behavioral
  - Medical conditions
  - Sedentary lifestyle

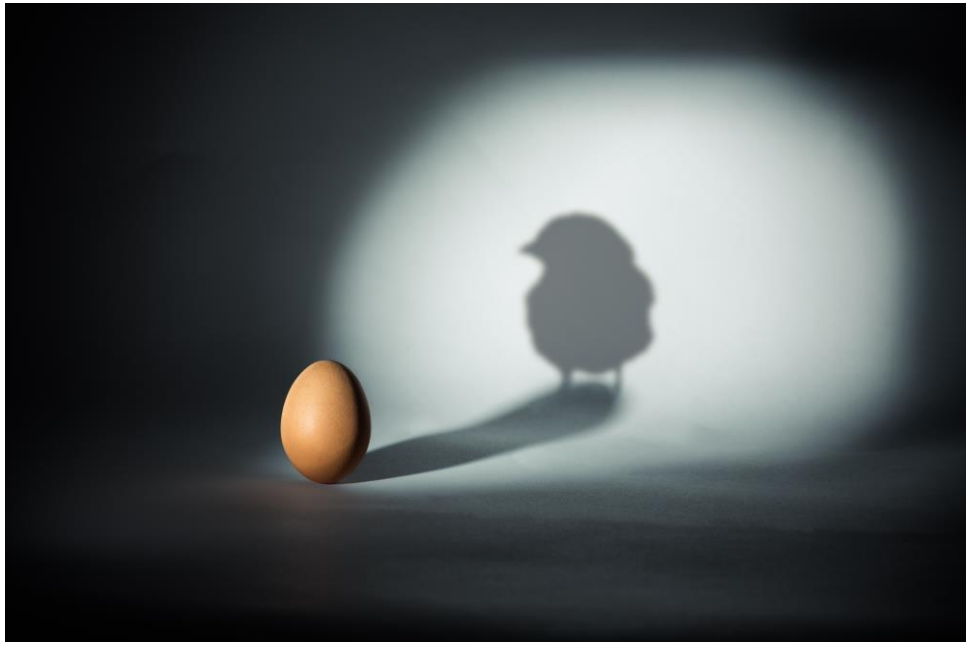
- **Aging pets:**
  - ↓ energy requirements
  - ↑ protein requirements
    - Diet-induced thermogenesis

$RER = 70 * (ideal\ BW_{kg})^{0.75}$
MER = RER x adjustment factor

Laflamme et al, (2012); Churchill & Eirmann, (2021)

MEDICAL FACTORS

- Polyphagia
  - Cushing's disease
  - Iatrogenic - steroid administration
- Altered metabolism
  - Hypothyroidism
- Hyperlipidemia
- Osteoarthritis



Chiang et. al (2022); Blanchard et. al (2024)

OTHER FACTORS

- Age
- Breed
- Neuter status
- Sex?
- Owner perception of weight

Chiang et. al (2022); Blanchard et. al (2024); Association for Pet Obesity Prevention

CONSEQUENCES & CO-MORBIDITIES

- State of chronic inflammation
- Osteoarthritis
- Neoplasia
- Diabetes mellitus & insulin resistance
- Shortened life span
- Higher anesthetic risk
- Respiratory disorders/dyspnea
- Metabolic disease
- Dermatopathy/inability to groom
- Dental disease
- Urinary tract infections

Lund et al (2005)

CONSEQUENCES & CO-MORBIDITIES

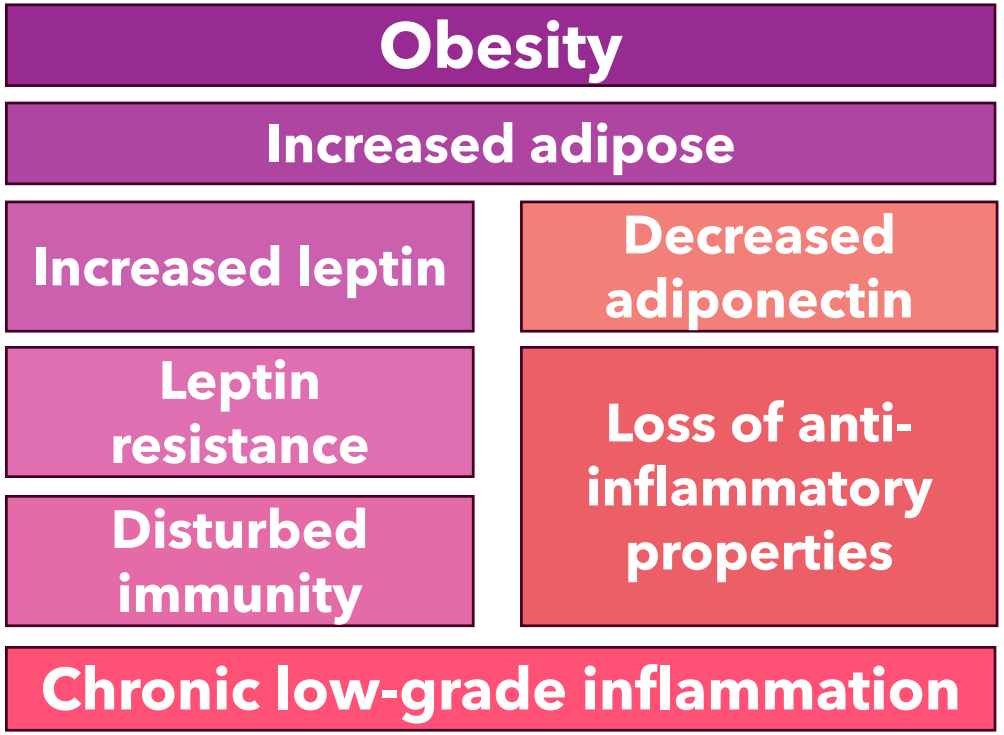
- **State of chronic inflammation**
- **Osteoarthritis**
- **Neoplasia**
- **Diabetes mellitus & insulin resistance**
- **Shortened life span**

- Higher anesthetic risk
- Respiratory disorders/dyspnea
- Metabolic disease
- Dermatopathy/inability to groom
- Dental disease
- Urinary tract infections

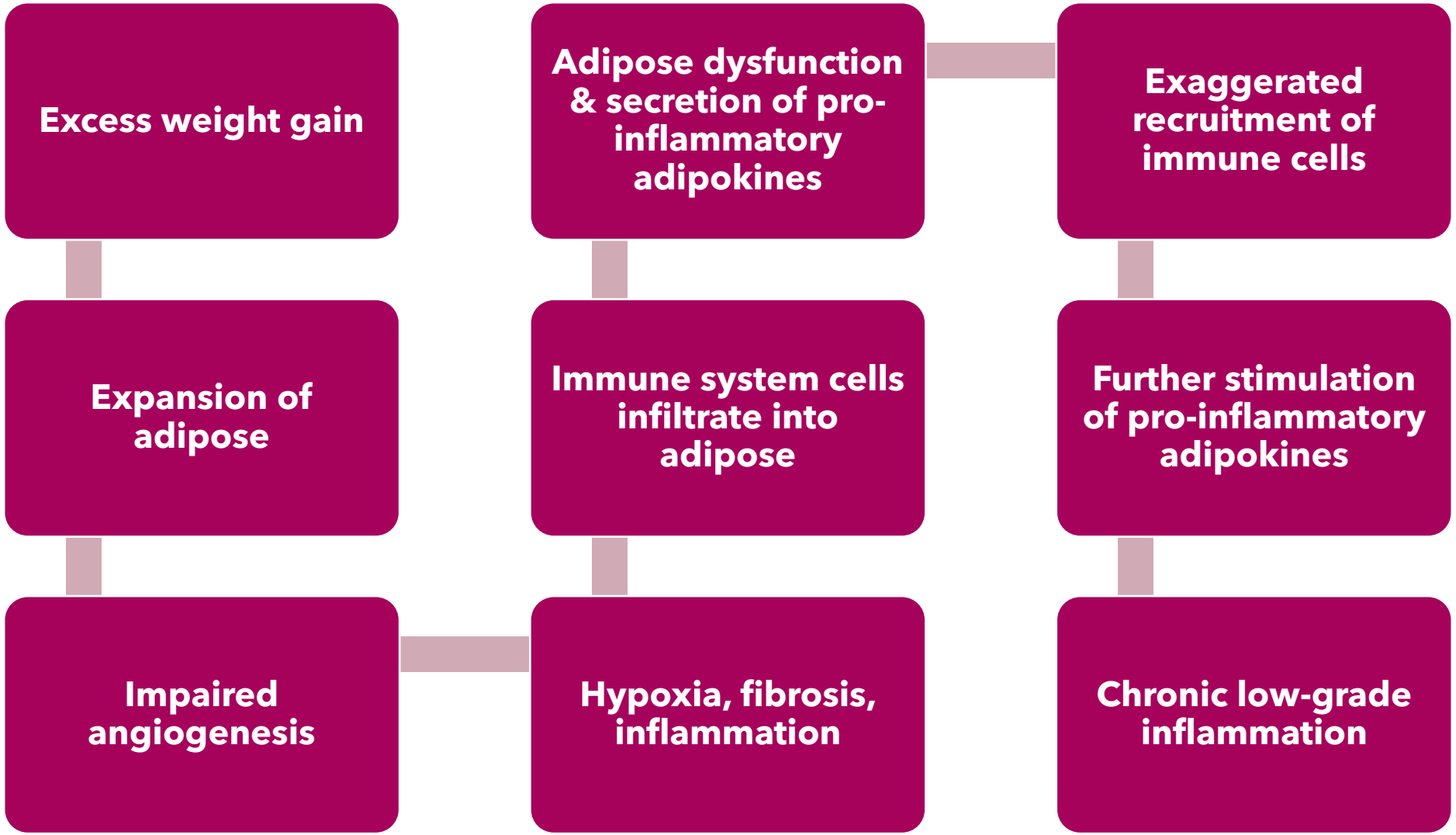
Lund et al (2005)

CHRONIC INFLAMMATION

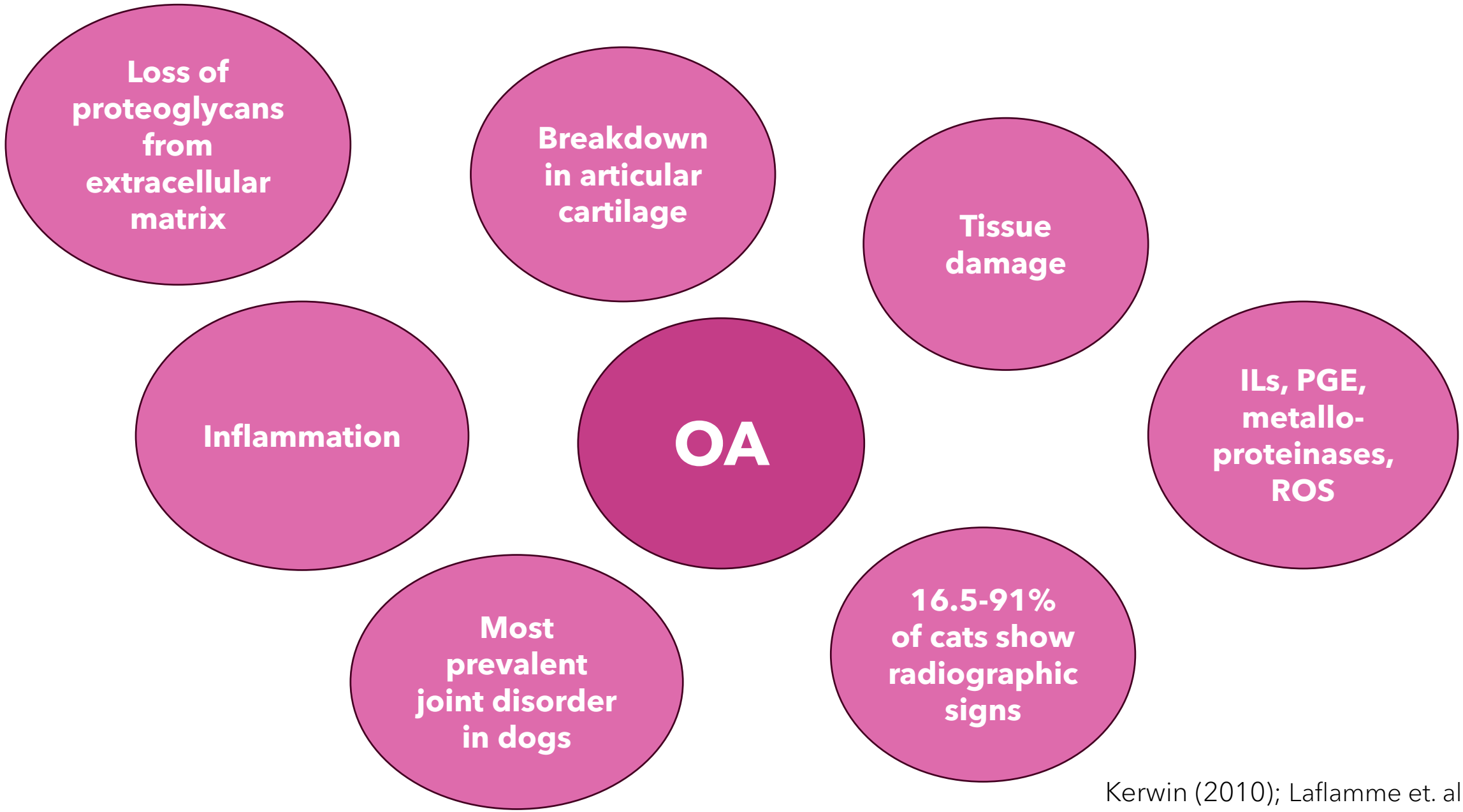
- Adipose = metabolically active endocrine organ
  - Active producer of:
    - Hormones
      - Leptin
      - Resistin
    - Inflammatory cytokines
      - TNF-α (tumor necrosis factor alpha)
      - Interleukins
      - C-reactive protein (CRP)
  - Downregulates adiponectin



Laflamme et al (2012); Marchi et al (2022)



Marchi et al (2022)



Kerwin (2010); Laflamme et. al (2012)

OSTEOARTHRITIS

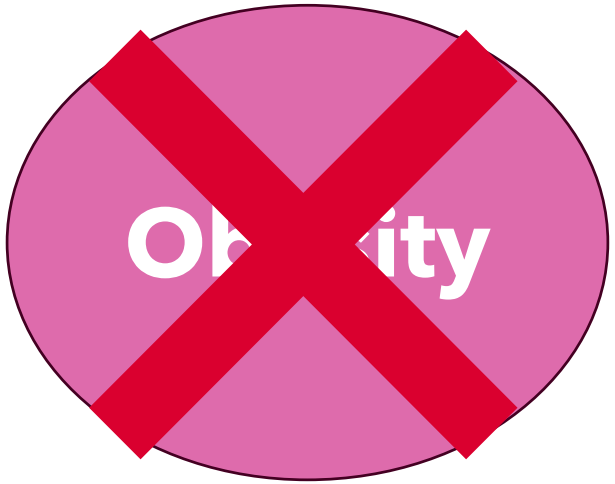
Obesity

- Added weight = stress on joints
- ↑ Oxidative stress (ROS)
- ↑ Inflammatory mediators

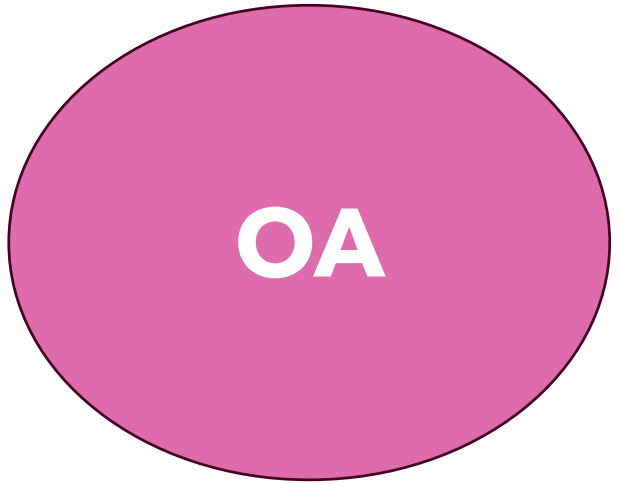
OA

Laflamme et. al (2012)

OSTEOARTHRITIS



- ↑ Joint mobility
- ↓ Lameness/pain



Laflamme et. al (2012)

OSTEOARTHRITIS

- Paired feeding study
  - 48 Labrador retrievers
  - Paired by sex and weight within litters
  - Control fed: free fed, then ideal weight energy requirements
  - Restricted/limit fed: 75% of control group
  - 8 year study

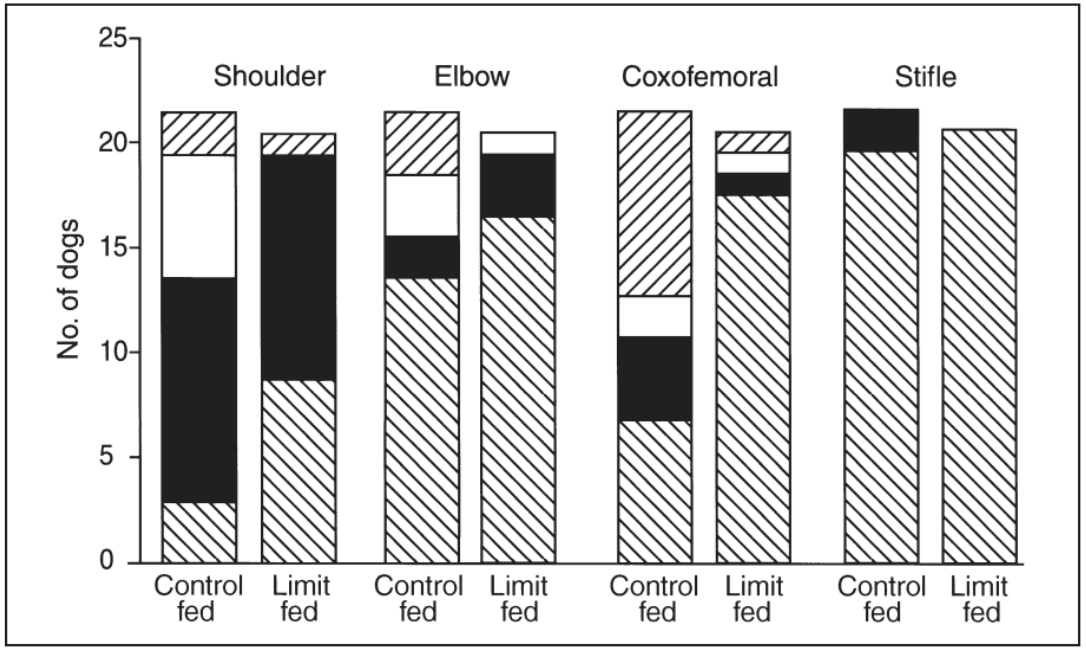


Figure 1—No. of dogs with severe (▨), moderate (□), mild (■), or no (▧) radiographic lesions of osteoarthritis in various joints.

Kealy et al (2000)

OSTEOARTHRITIS

Radiographic OA prevalence	
Multiple joints	Control-fed > restricted-fed
Hip joint	Control-fed: 15/22 Restricted-fed: 3/21
Shoulder joint	Control-fed: 19/22 Restricted-fed: 12/21
Elbow joint	Increased severity in control-fed

Kealy et al (2000)

OSTEOARTHRITIS

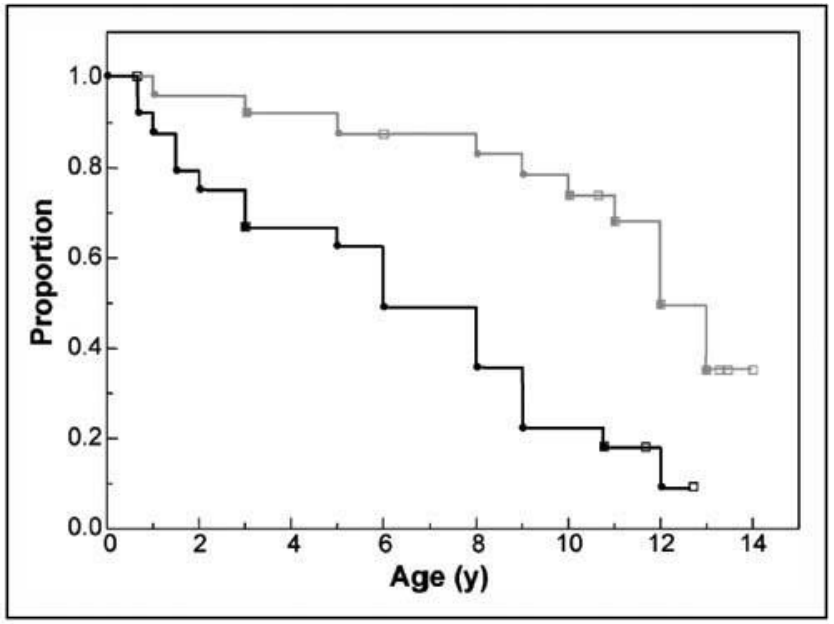


Figure 1—Results of Kaplan-Meier analysis for proportion of Labrador Retrievers (gray line = restricted-fed dogs [n = 24]; black line = control-fed dogs [24]) without radiographic evidence of hip joint osteoarthritis.

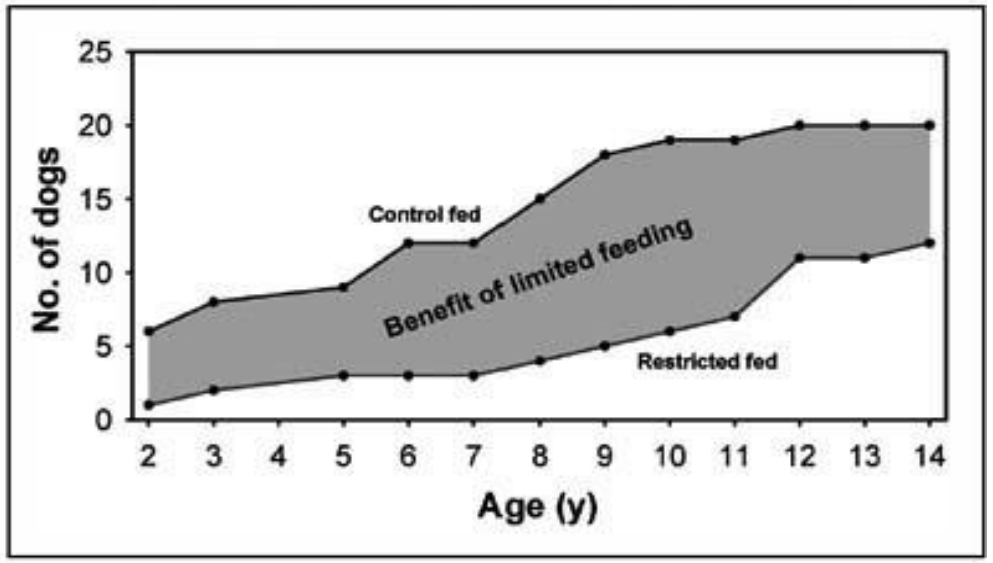


Figure 2—Cumulative prevalence of hip joint osteoarthritis in the same dogs as in Figure 1.

Smith et al (2006)

OSTEOARTHRITIS

Radiographic OA prevalence: Hip joint

	Control-fed:	Restricted-fed:	
Average BCS: 6.7/9	**Earlier median age of onset - 6 years**	**Later median age of onset - 12 years**	**Average BCS: 4.6/9**
	Increased prevalence - 83%	**Decreased prevalence - 50%**	

Smith et al (2006)

OSTEOARTHRITIS

- Prospective study - 14 client-owned dogs
  - Clinical & radiographic OA
  - 20%+ above ideal body weight
  - Therapeutic weight-loss diet – 16 weeks
  - Six follow-up visits assessed:
    - Body weight
    - Pelvic circumference
    - Severity of lameness

8.6% initial BW lost
6.92% pelvic circumference lost

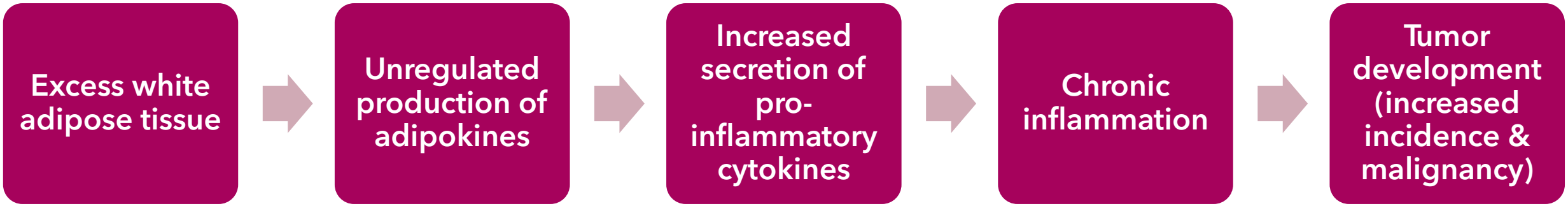
6.10%+ BW loss caused significant decrease in lameness

8.85%+ BW loss caused ground reaction forces measured in worst affected limb to increase

BW reduction causes a decrease in clinical signs of lameness

Marshall et al (2010)

NEOPLASIA



Marchi et al (2022)

Hormonal carcinogenesis

In humans

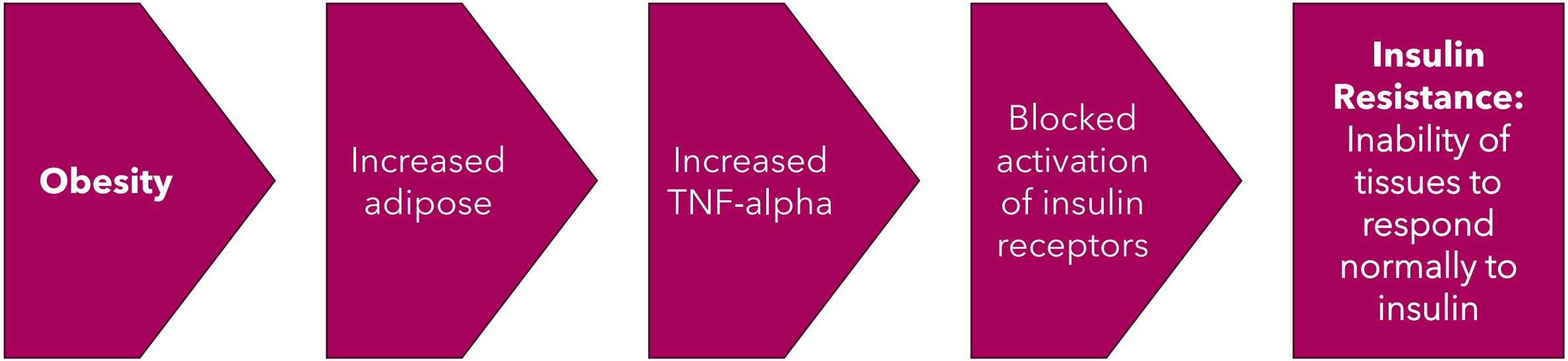
- Adipose tissue dysfunction
- High estrogen
- Post-menopausal breast cancer
- Inflammatory state
- Estrogen signaling dysfunction
- Mutagenesis, DNA damage, cell proliferation, angiogenesis

In animals

- Prolactin & steroid hormones
- Canine mammary cancer
- Adipose secretion of aromatase
- Conversion of androgen hormones into estrogen

Lund et al (2005); Marchi et al (2022)

INSULIN RESISTANCE



Laflamme et al (2012)

INSULIN RESISTANCE

Laflamme et al (2012)

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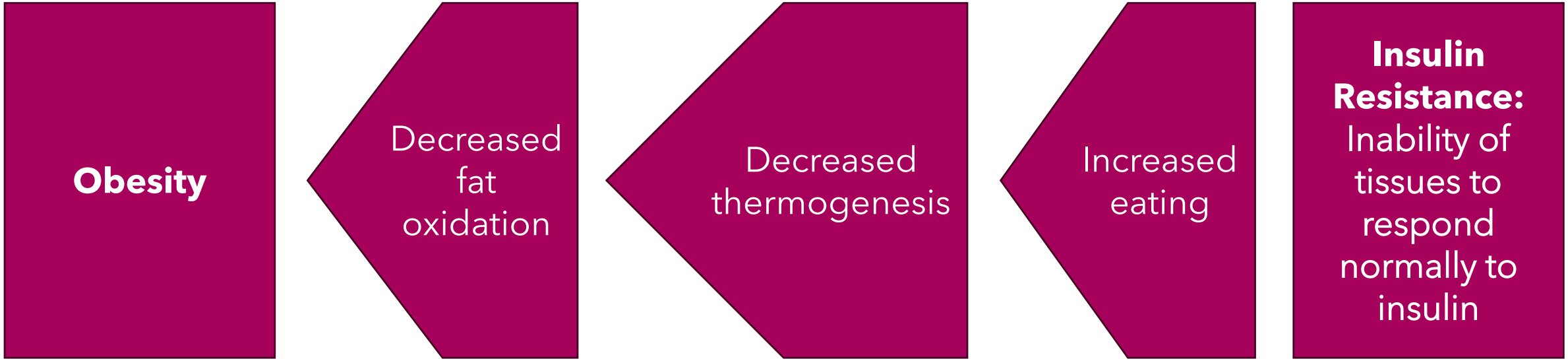
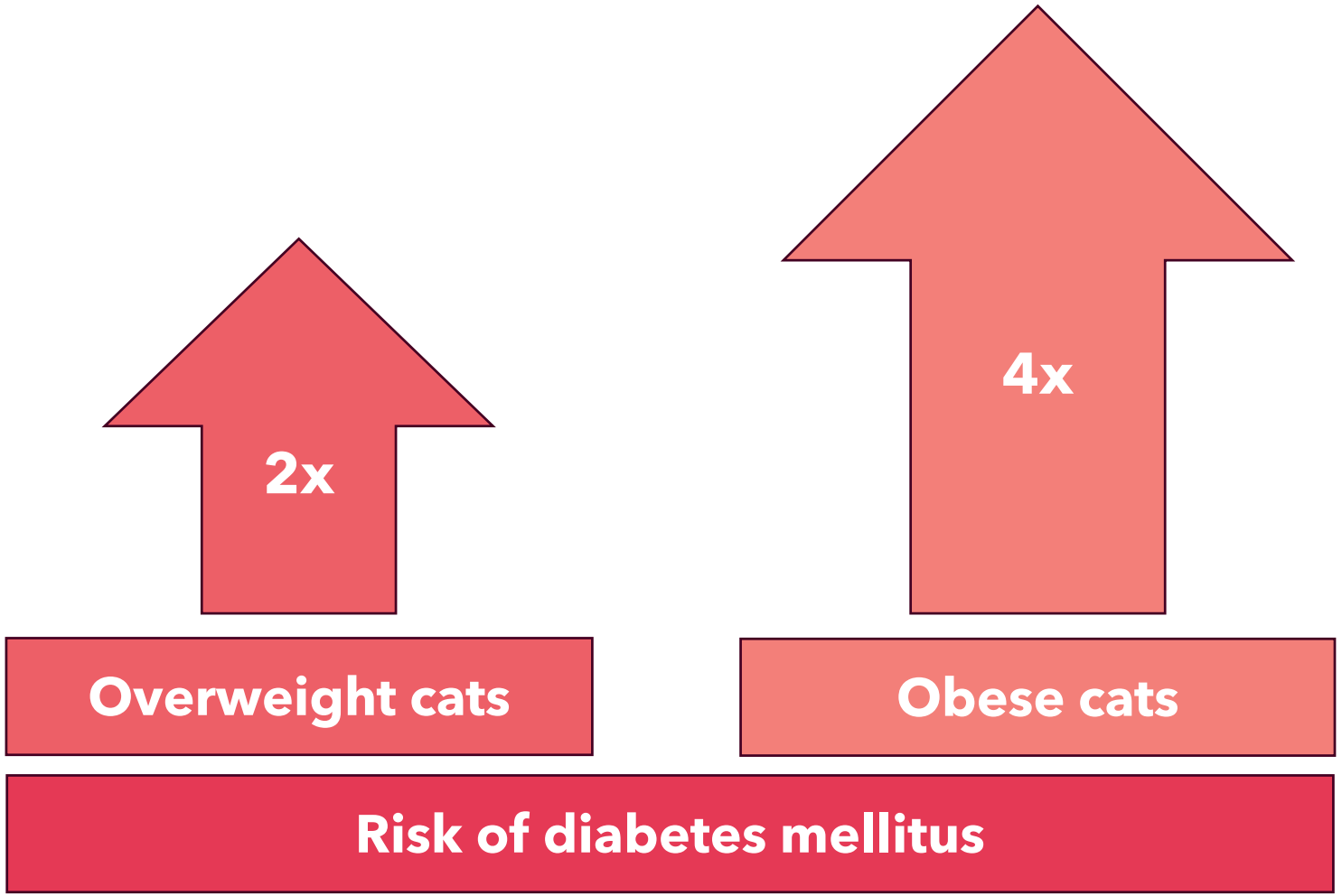
Laflamme et al (2012)

INSULIN RESISTANCE



Laflamme et al (2012)

A QUICK NOTE ON DIABETES



Lund et al (2005);
Laflamme et al (2012)

SHORTENED LIFE SPAN

- Overweight dogs:
  - ↑ Risk of instantaneous death
  - ↓ Lifespan in all breeds and ages

13 years **11.2 years**

- Indirect associations with lifespan
  - Predisposition or exacerbation of disease
    - Lean dogs have delayed onset for requiring long-term treatment of chronic diseases, including OA
  - Decreased quality of life

Kealy et al (2002); Salt et al (2018)

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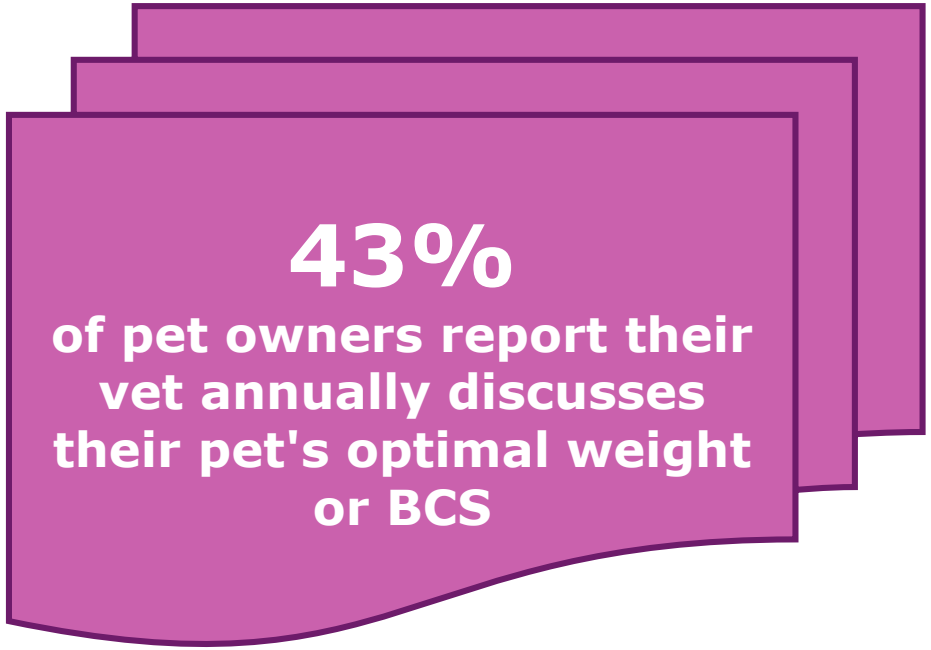
#1 reason

why dog & cat owners would participate in a weight management program for their pet

Kealy et al (2002); Salt et al (2018);
Davies et al (2024); Sutherland et al (2024)

HOW CAN WE HELP?

- Obese/overweight **IS** a diagnosis!
  - Not consistently recorded
  - Discuss ideal weight
- Complete physical exam & records
  - Body weight **and** body condition score
  - Muscle condition score
  - Diet history
- Client education
- Feel comfortable making a weight loss plan



Chiang et al (2022); Association for Pet Obesity Prevention 2023 Survey Data

DEVELOPING A WEIGHT LOSS PLAN

- Negative energy balance
  - Therapeutic weight loss food
    - Reduction in calories
    - ↑ Protein
    - ↑ Fiber
  - ↑ Exercise
- Treats: 10% of total diet
- Consistent monitoring
- Client education

- **Aging pets:**
  - Consider comorbidities
  - Taste preferences/aversions
  - Remember higher protein requirements
  - Omega-3's & antioxidants

Cats: 0.5-1% BW lost per week

Dogs: 1-2% BW lost per week

"BETTY"

- 12 y/o FS Beagle mix
- Starting weight: 33 lbs
- Starting BCS: 8/9
- Enrolled May 2023

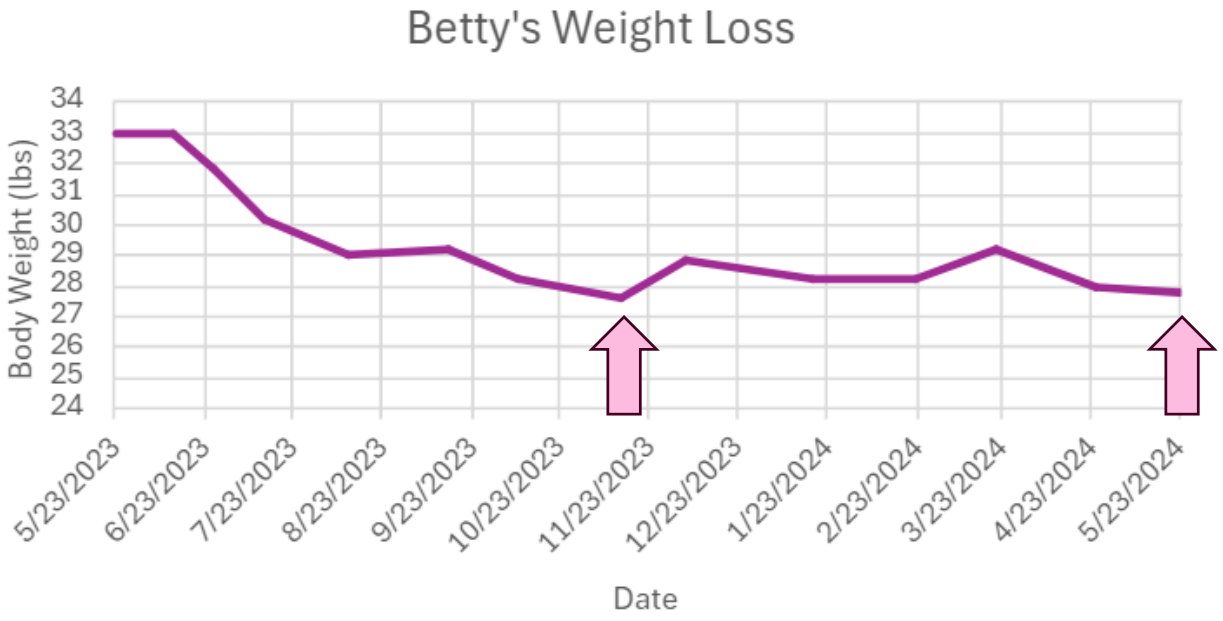

20
15-25% Body Fat
30
25-35% Body Fat
40
35-45% Body Fat
50
45-55% Body Fat
60
55-65% Body Fat
70
65-75% Body Fat
Healthy Weight
Moderate Risk
High Risk
Serious Risk
Severe Risk
Extreme Risk

Current Weight	Ideal Body Weight [lbs]					
	Body Fat % 20	Body Fat % 30	Body Fat % 40	Body Fat % 50	Body Fat % 60	Body Fat % 70
10	10	8.8	7.5	6.3	5.0	3.8
11	11	9.6	8.3	6.9	5.5	4.1
12	12	10.5	9.0	7.5	6.0	4.5
13	13	11.4	9.8	8.1	6.5	4.9
14	14	12.3	10.5	8.8	7.0	5.3
15	15	13.1	11.3	9.4	7.5	5.6
20	20	17.5	15.0	12.5	10.0	7.5
25	25	21.9	18.8	15.6	12.5	9.4
30	30	26.3	22.5	18.8	15.0	11.3
35	35	30.6	26.3	21.9	17.5	13.1
40	40	35.0	30.0	25.0	20.0	15.0
45	45	39.4	33.8	28.1	22.5	16.9
50	50	43.8	37.5	31.3	25.0	18.8
55	55	48.1	41.3	34.4	27.5	20.6
60	60	52.5	45.0	37.5	30.0	22.5
65	65	56.9	48.8	40.6	32.5	24.4
70	70	61.3	52.5	43.8	35.0	26.3
75	75	65.6	56.3	46.9	37.5	28.1
80	80	70.0	60.0	50.0	40.0	30.0
85	85	74.4	63.8	53.1	42.5	31.9
90	90	78.8	67.5	56.3	45.0	33.8
95	95	83.1	71.3	59.4	47.5	35.6
100	100	87.5	75.0	62.5	50.0	37.5
105	105	91.9	78.8	65.6	52.5	39.4
110	110	96.3	82.5	68.8	55.0	41.3
115	115	100.6	86.3	71.9	57.5	43.1
120	120	105.0	90.0	75.0	60.0	45.0
130	130	113.8	97.5	81.3	65.0	48.8
140	140	122.5	105.0	87.5	70.0	52.5
150	150	131.3	112.5	93.8	75.0	56.3
160	160	140.0	120.0	100.0	80.0	60.0

"BETTY"

- 1 year later... (May 2024)

- Ending weight: 27.8 lbs
- Ending BCS: 5/9



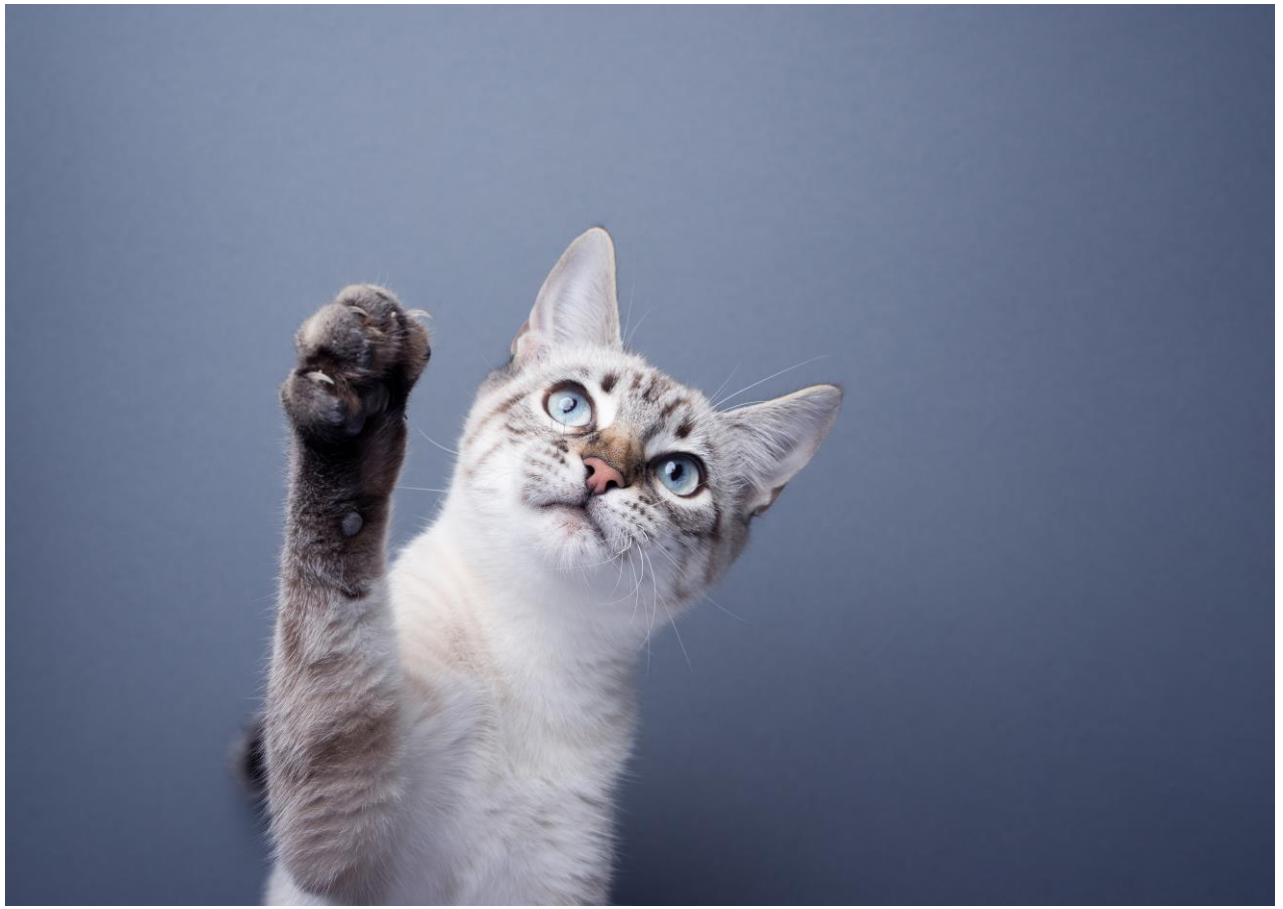
ONE LAST THING...

This information is for educational purposes only.

Clinical Nutrition Internship is funded by Hill's Pet Nutrition.

Thank you to Dr. Nelson & Dr. Getty! ☺

QUESTIONS?



Hill's®
Transforming Lives™

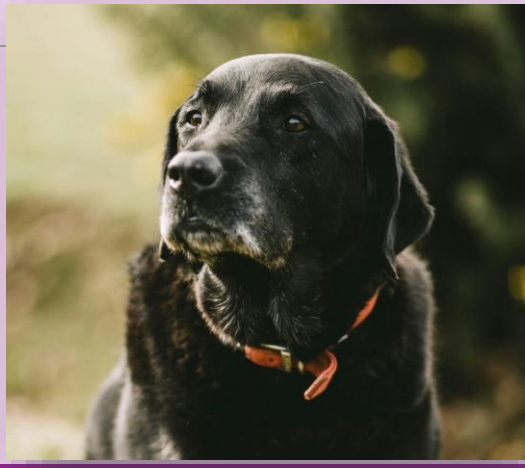
Canine Cognitive Dysfunction

SUSAN NELSON, DVM

CANINE AND FELINE COGNITIVE DYSFUNCTION SYNDROME
(or are they just getting old?)

2024 KANSAS STATE UNIVERSITY
NUTRITION CONFERENCE

SUSAN NELSON, DVM



Canine and Feline Cognitive Dysfunction Syndrome (CDS) Learning Points

- Prevalence
- Causes
- Symptoms
- Diagnosing
- Treatments

What are Cognitive Functions?

- Cognitive functions include the mental processes of...
  - Perception
  - Awareness
  - Learning
  - Memory

- These allow an individual to
  - Acquire information about the environment
  - Decide how to act

Cognitive Dysfunction Syndrome (CDS)

- Is a neurobehavioral disorder

- It is characterized by an age-related decline in:

  1. Cognitive abilities to the point they affect functioning

  2. Behavior changes that are not attributable to other medical conditions

Prevalence of CDS in Dogs is **Extremely High**

- 28% in 11- to 12-year-old dogs
- 68% in 15- to 16-year-old dogs
- Nearly **100%** of dogs **>16 years** showed at least 1 sign

Salvin et al (2010)

- 2 year longitudinal study ≥ 8 years
  - 33% of dogs with normal cognitive status progressed to mild cognitive impairment
  - 22% of dogs with mild cognitive impairment progressed to CD

Schutt et al (2015)

Other Risk Factors for CDS in Dogs

- Studies have **not** found any sex or size correlation
- Recent literature does **not** suggest any breed predilections
- It can be influenced by **Genetics, Diet and Lifestyle**

Dewey et al (2019)

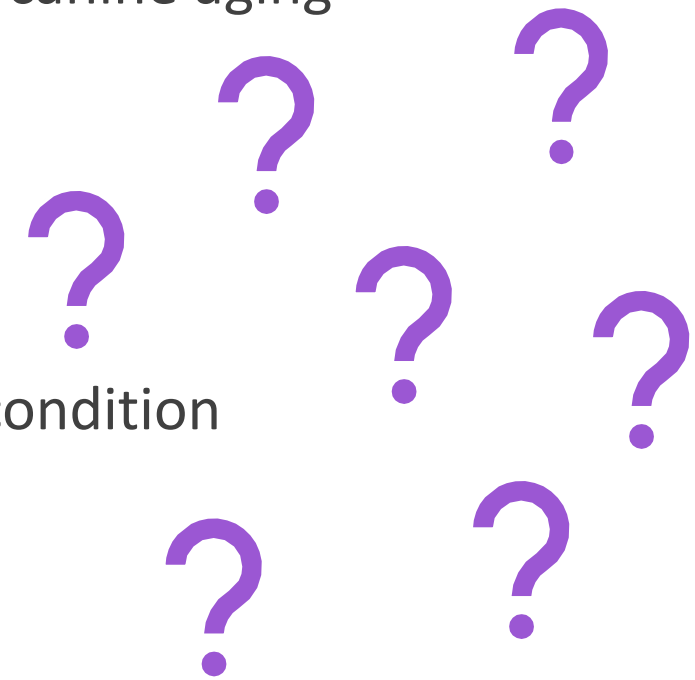
CCD is Likely Significantly **Under-Reported** in the General Canine Population

- Prevalence rate of CCD estimated to be 14.2%
- Only 1.9% of cases diagnosed by a veterinarian

Salvin et al (2010)

Why is CCD Under-Reported by Owners?

1. Mild cognitive impairment reflects normal canine aging
2. CDS is not common
3. There are no effective treatments for the condition



- Short appointment times

Better Education of Both Clients and Veterinarians is Needed

- Dogs are less likely to develop such severe impairment as occurs in people with Alzheimer's Disease (AD)
- Typically respond well to medical intervention
- Interventions typically applied have little to no adverse effects

Schutt et al (2016)

The Pathophysiology of CCD is Multifactorial and Complex

- ↓ Glucose uptake and metabolism in the brain
  - Mitochondrial dysfunction
- Oxidative damage
  - ↑ percentage of polyunsaturated fatty acids
  - ↓ levels of endogenous antioxidant activity
- ↑Perivascular changes
- ↑Amyloid plaques in the hippocampus and cerebral cortex
  - Mitochondrial dysfunction

Aβ is a Protein Produced by Degradation of Amyloid Precursor Protein

- **Deposition of AMYLOID PLAQUES** in the brain parenchyma and walls of the cerebral blood vessels
  - Prefrontal Cortex
  - Temporal Cortex
  - Hippocampus
  - Occipital Cortex

- Regardless of position, the amount and extent of Aβ deposits ↔ severity of cognitive impairment

Cummings et al (1996)

Neurotransmitter Function Changes as Chemical Levels are Altered

- Depletion of catecholamine neurotransmitters
  - Monoamine oxidase
  - Serotonin
  - Dopamine
- ↑ Monoamine oxidase B (MAO-B) activity
- ↓ Endogenous antioxidants
- Decline in the **cholinergic system****
  - Acetylcholine

Dewey et al (2019)

Brains of Older Dogs Have **Neuropathological Lesions** Similar to Those Seen in People With Alzheimer's Disease (AD)

Structural brain abnormalities identified grossly and on MRI in both people with Alzheimer disease and dogs with canine cognitive dysfunction

- Cerebrovascular disease
- Infarcts
- Microhemorrhages, occ. macrohemorrhages
- Cerebral atrophy
- Meningeal thickening
- Ventricular dilatation
- Gliosis

Dewey et al (2019)

Canine CDS Symptoms

- Body systems undergo both **physiologic** and **metabolic** changes with age

- These changes → **Behavioral Issues**

1. Separation anxiety
2. Destruction
3. House soiling

TOP 3 Reported Behavior Symptoms

Symptoms of CDS in Dogs

- ↓ Reaction to stimuli
- ↓ Exploratory behavior
- ↑Confusion
- ↑Disorientation
- ↓ interaction with owners and other dogs
- Irritability
- Anxiety
- Slowness in obeying commands
- Problems performing previously learned behaviors
- Altered sleep-wake cycles

Dewey et al (2019)

- Inattentiveness
- Inactivity
- Compulsive wandering and pacing, especially at night
- Demented behavior
- Urinary and/or fecal incontinence (posture normally, but void inappropriately)
- Difficulty navigating stairs
- Attempting to pass through inappropriately narrow spaces
- Unable to locate dropped food
- Getting lost in familiar environments
- Unable to recognize familiar people or animals
- Decreased interaction with family
- Apparent hearing loss
- Excessive vocalization especially at night
- Acting senile

Which Symptoms Associated with CDS do **OWNERS** Generally Report for Their Dogs?

- Altered sleep-wake cycle
- Confusion or disorientation
- Reduced interactions with owners
- Anxiety

Fast et all (2013)

WHAT ARE SOME PHYSICAL CHANGES THAT COULD BE MISTAKEN FOR CDS?

- Arthritis in joints
- Spinal spondylosis
- Decreased muscle mass (sarcopenia)
- Nuclear sclerosis
- Cataracts
- Deafness
- Decreased smelling ability
- Decreased taste senses
- Changes in digestion and respiration
- Urinary incontinence
- Forebrain tumor

A Thorough Physical Exam and Medical Workup are **ESSENTIAL**

- May have underlying, treatable metabolic issues
- These may be chronic and continue to contribute to the behavior issues, even if treated
- Treat behavior issues **AFTER** any medical issues have been addressed and treated

What do Veterinarians Need to do to Diagnosis CCD or Exclude It?

- **Thorough physical examination**
  - Neurologic examination
  - Orthopedic examination
  - Pain assessment

- **Appropriate diagnostic testing**
  - CBC
  - Biochemistry panel
  - Urinalysis
  - Systemic blood pressure

Additional Diagnostic Tests

- Radiography
- Ultrasonography
- Endocrine tests
  - Thyroid
  - Cushing's
- CSF assessment

- **Brain MRI**
  - Usually shows A SMALL INTERTHALAMIC ADHESION THICKNESS

Dewey et al (2019)

What Might You See in the Exam Room?

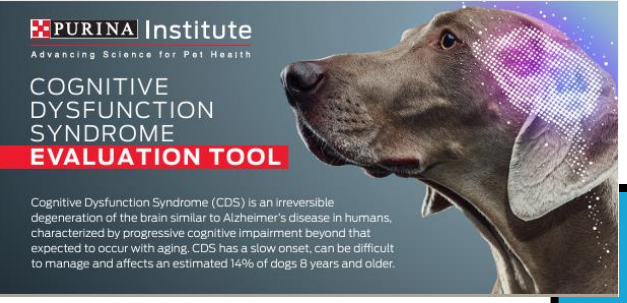
- Often related to forebrain dysfunction
  - Anxiety
  - Abnormal mentation
  - Compulsive circling
  - Absent or inappropriate response to visual/auditory stimuli
  - Excessively resistant to even mild restraint
  - Transient vestibular episodes*
  - Recent onset of possible seizure activity*

Dewey et al (2019)

A Complete **History** is also Important

- Medications currently taking
- Behavioral changes observed

  - **Origin**, **duration** and **progression**
  - **When** and **where** problem behavior occurs
  - **Concurrent** behavior issues
  - **Who is involved** when behavioral **problem occurs**
  - **Routine** interactions
  - **Changes** in routine
  - **Pet--owner** interactions
  - What happens in a **24 hour period**



D DISORIENTATION	• Gets stuck, difficulty getting around objects, goes to hinge side of door • Stares blankly at walls, floor, or into space • Does not recognize familiar people/familiar pets • Gets lost in home or yard • Less reactive to visual (sights) or auditory (sounds) stimuli
I SOCIAL INTERACTIONS	• More irritable/fearful/aggressive with visitors, family or other animals • Decreased interest in approaching, greeting or affection/petting
S SLEEP/WAKE CYCLES	• Pacing/restless/sleeps less/waking at night • Vocalization at night
H HOUSESOILING, LEARNING AND MEMORY	• Less able to learn new tasks or respond to previously learned commands/name/work • Indoor soiling of urine or stool/decreased signaling to go out • Difficulty getting dog's attention/increased distraction/decreased focus
A ACTIVITY	• Decrease in exploration or play with toys, family members, other pets • Increased activity, including aimless pacing or wandering • Repetitive behaviors (e.g., circling/chewing/licking/stargazing)
A ANXIETY	• Increased anxiety when separated from owners • More reactive/fearful to visual (sights) or auditory (sounds) stimuli • Increased fear of places/locations (e.g., new environments/going outdoors)

[1]*Salvin, HE, McGreevy, PD, Sachdev, PS, & Valenzuela, MJ (2010). Underdiagnosis of canine cognitive dysfunction: a cross-sectional survey of older companion dogs.* Veterinary Journal *(London, England : 1997), 184(3), 277–81. doi:10.1016/j.tvjl.2009.11.007*

BEHAVIORAL SIGNS Identify signs that have arisen or progressed since 8 years of age and older. **Score as 0=none, 1=mild, 2=moderate, 3=severe**	**Score**
DISORIENTATION	
Gets stuck, difficulty getting around objects, goes to hinge side of door	
Stares blankly at walls, floor, or into space	
Does not recognize familiar people/familiar pets	
Gets lost in home or yard	
Less reactive to visual (sights) or auditory (sounds) stimuli	

SOCIAL INTERACTIONS	
More irritable/fearful/aggressive with visitors, family or other animals	
Decreased interest in approaching, greeting or affection/petting	
SLEEP/WAKE CYCLES	
Pacing/restless/sleeps less/waking at night	
Vocalization at night	
HOUSESOILING, LEARNING AND MEMORY	
Less able to learn new tasks or respond to previously learned commands/name/work	
Indoor soiling of urine ___ or stool ___ /decreased signaling to go out	
Difficulty getting dog's attention/increased distraction/decreased focus	
ACTIVITY	
Decrease in exploration or play with toys, family members, other pets	
Increased activity including aimless pacing or wandering	
Repetitive behaviors, e.g., circling ___ chewing ___ licking ___ stargazing ___	
ANXIETY	
Increased anxiety when separated from owners	
More reactive/fearful to visual (sights) or auditory (sounds) stimuli	
Increased fear of places/locations (e.g., new environments/going outdoors)	
TOTAL (BE SURE TO CARRY OVER THE SCORES FROM FRONT SIDE OF SHEET)	

Once this form is completed, your veterinarian will determine the cause of these signs through a physical examination and recommended diagnostic tests. However, even if your senior pet is experiencing multiple health issues associated with aging, there may be some degree of CDS.

A score of 4-15 is consistent with mild, 16-33 is moderate, and >33 is severe CDS.

Goals For Treatment of CCD

- **Slow the progression** of the disease
- **Maintain** the **quality of life** for both the patient and family

Commercial Diets

- Hill’s Prescription b/d diet*
- Purina One Vibrant Maturity 7+
- Purina Neurocare*
- Royal Canin Canine Mature Consult

MCT and Coconut Oil Supplementation

- Use pure MCT oil and top dress the food
- To get the highest dose of MCTs
  - Use nutraceutical MCT oils
  - Coconut and Palm Kernel oil (pure MCTs at 100% of the oil)
- Approximately **5%** of the dry matter in the diet initially
  - Top dress a commercial food **OR**
  - Use primarily coconut oil as a fat source in a properly formulated home-prepared diet
    - Coconut oil 10% of calories in the diet
    - MCT oil addition provides 5% of the calories
- Treats
  - Can create imbalance in the diet regimen
  - Be conservative with addition of the oil!

Dewey et al (2019)

MCT and Coconut Oil Supplementation

Calculated metabolizable energy for average elderly dog with potential amounts of coconut or medium-chain triglyceride oils that can be used to help with canine cognitive dysfunction

Dog Weight (kg)	ME (Kcal)[a]	10% ME Coconut Oil	5% ME MCT Oil	10% ME MCT Oil
5	335	1 tspn (35 kcal)	0.5 tspn (18 kcal)	1 tspn (35 kcal)
10	570	1.5 tspn (53 kcal)	0.75 tspn (27 kcal)	1.5 tspn (53 kcal)
20	950	3 tspn (105 kcal)	1.5 tspn (53 kcal)	3 tspn (105 kcal)
30	1280	3.5 tspn (123 kcal)	1.75 tspn (62 kcal)	3.5 tspn (123 kcal)
40	1590	4.5 tspn (158 kcal)	2.25 tspn (79 kcal)	4.5 tspn (158 kcal)
50	1880	5 tspn (175 kcal)	2.5 tspn (88 kcal)	5 tspn (175 kcal)

Abbreviations: ME, metabolizable energy; tspn, teaspoon.
a ME calculated from average ME for low-activity elderly dog – 100 (kg).0.75

Dewey et al (2019)

Supplements recommended for people affected by Alzheimer Disease

- Vitamins B (B12), C, and E
- Mitochondrial cofactors (L-carnitine and DL-a-lipoic acid)
- Carotenoids (green leafy vegetables)

Nutraceuticals

- Apoaequorin (calcium buffering protein)
- Melatonin
- Valerian root
- Docosahexaenoic acid (Omega 3 fatty acid)
- Various antioxidants
  - Can act as mitochondrial cofactors
  - Increase cellular endogenous antioxidant upregulation
- Mitochondrial cofactors (e.g. L-carnitine, DL-a-lipoic acid)

- **SAMe (Denosyl®), Novifit®** (S-adenosyl-methionine) and milk thistle
  - Elimination the free radicals in both the brain and liver
- **Gingko biloba**
  - Increases blood flow to the brain
- **Senelife®**
  - Reservatrol (a polyphenol), Vitamins E and B6, phosphatidylserine, ginko biloba
- **Aktivaik®**
  - Phosphatidylserine (a phospholipid), omega-3 fatty acids, vitamins E and C, L-carnitine, α-lipoic acid, coenzyme Q, selenium
- **Proneurozone™**
  - Acetyl-L-Carnitine, Alpha Lipoic Acid, Spirulina, Soy Lecithin, Omega-3 Fatty Acids, Bioflavanol, Cranberry, Niacin, Cysteine, Bilberry, Vitamin E, Thiamine, Riboflavin, Rosemary, Sage, Vitamin B6, Folic Acid, Vitamin B12

Exercise

- 2 x 20 minute outdoor walks per day
- Cognitive enrichment

Interactive Play and Training (30 min. 5x per week)

- New toys
- Padded surfaces for sitting and traction for movement
- Painful pets
  - “Stand” or “look” commands may replace frequent “sit” or “down” cues
- Adjust behavior signals used in training if sensory dysfunction is significant
  - Tactile cues or hand signals
- More powerful motivators for learning may be needed
  - High-value food rewards

Maintain a Regular Routine

- Keep on a consistent schedule
  - Feeding
  - Walking
- Do not change up the environment

Food Puzzles

- Encourage mental facilitation
- Provide regular mental stimulation and enrichment

Pharmaceutical Intervention

- **Selegiline (Anipryl®)**
- MAO-B inhibitor
- Shown to increase cognitive function in dogs
  - Antioxidant
  - Enhances catecholamines
- Dose: 0.5-1 mg/kg PO once daily in the **morning**

Selegiline (Anipryl®)

- Helps ↓ changes in the sleep-wake cycle
- Improved cognitive function usually seen in **2-4 weeks**
  - **Up to 2 months** in some
- Changes may be **subtle**
  - Encourage keeping a journal/log of any noted behavioral changes

Important Contraindications/Precautions for Selegiline

- Don’t use in conjunction with…
  - Ephedrine
  - Other MOAI’s
  - Tricyclic antidepressants (TCA)
  - SSRI’s
  - Meperidine
  - Opioids
  - Amitraz (Mitaban® dip)

- Allow at least **14 days** between stopping selegiline and starting a TCA
- Allow at least **5 weeks** between stopping SSRI’s and starting selegiline

Memantine

- **N-Methyl-d-Aspartate Receptor Antagonists (NMBA)**
- Binds to N-methyl-d-aspartate receptors in the brain
- Blocks activity of glutamate
- Used in dogs to treat compulsive behaviors
  - 0.3 to 1.0 mg/kg PO q12h

Other Drugs That May be Useful

- Levetiracetam (Keppra®)
  - Decreases hyperexcitability
    - 20-30 mg/kg q 8 hr.
- GABAergic drugs to decrease anxiety
  - Gabapentin or Pregabalin
    - Gabapentin 10-20 mg/kg PO q 8-12 hr.
- Anti-inflammatory drugs (eg, carprofen)

(Dewey et al 2019)

Not available in North America

- **Propentofylline (Vivitonin® or Karsivan®)**
  - Xanthine derivative
  - Licensed to combat dullness and lethargy in older dogs

- **Nicergoline**
  - Contains adrenergic antagonists
  - Increases blood flow in the brain
  - Enhances neuronal transmission

Individual Chinese herbs and their relevant molecular mechanisms

Latin and Chinese (in Parentheses) Herbal Name	Mechanism of Action
Ginkgo biloba (Bai Guo)	Antioxidant; antiapoptotic; antiinflammatory
Huperzia serrata (Qian Ceng Ta)	Procholinergic; antiglutamate (NMDA antagonism)
Curcuma longa (Yu Jin)	Inhibits Aβ production; antioxidant; antiinflammatory
Ginseng (Ren Shen)	Antioxidant; antiglutamate (NMDA antagonism); decrease Aβ
Coptis chinensis (Huang Lian)	Inhibits Aβ production; procholinergic; antioxidant; antiinflammatory
Polygala tenuifolia (Yuan Zhi)	Inhibits Aβ production; antiapoptotic
Salvia miltiorrhiza (Dan Shen)	Inhibits Aβ aggregation; antioxidant; antiinflammatory
Angelica sinsensis (Dang Gui)	Antioxidant; antiinflammatory
Crocus sativus (Zang Hong Hua)	Antioxidant; antiapoptotic
Gastrodia elata (Tian Ma)	Procholinergic; antioxidant
Rehmannia glutinosa (Shu Di Huang)	Procholinergic; antioxidant
Epimedium (Yin Yang Huo)	Antioxidant; antiapoptotic
Magnolia officinalis (Xin Yi Hua)	Procholinergic; antioxidant
Scutellaria baicalensis (Huang Qin)	Inhibits Aβ aggregation; antioxidant; antiinflammatory; antiapoptotic
Camellia sinensis (Cha Hua)	Reduces Aβ levels; antioxidant; antiinflammatory; antiapoptotic

Dewey et al (2019)

Other Complimentary Therapies

- Compression garments
  - Thundershirt
  - Anxiety Wrap
- Dog Appeasing Pheromone
- Aromatherapy
- Massage
- Physical therapy
- Acupuncture (Electroacupuncture)
  - Enhance brain neuroplasticity

Mechanism of Action for Positive Effects Seen with Acupuncture

- Enhanced neuronal glucose use
- ↓ Accumulation of Aβ in the brain
- ↑ Production of neurotrophic factors
- Proliferation of neuronal stem cells
- Hippocampus
  - Protection or recovery from synaptic loss and dendritic atrophy in the hippocampus

Prevalence of CDS in Cats

- 36% in a population of 11- to 21-year-old cats
- The incidence of behavior changes increases with advancing age
  - 28% of cats aged 11 to 14 years.
  - 50% cats aged 15 years and older

Gunn-Moore et al (2007), Moffat et al (2003)

Causes of Feline CDS

- Compromised cerebral blood flow
- Presence of small hemorrhages around the blood vessels
- Chronic free radical damage
- Likely similar to dogs/humans in respect to **Genetics**, **Life Style** and **Diet**

Symptoms

- The **most common behaviors** seen in 11- to 14-year-old age group
  - Alterations in social interactions
- **Most common signs** in cats aged 15 years and ↑
  - Aimless activity
  - Excess vocalization
- **Disorientation**
  - It's estimated that disorientation occurs in at least 40% of cats aged 17 years and ↑

Gunn-Moore (2007)

VISHDAAL

- **V**ocalization
- **A**lterations in interactions
- **C**hanges in sleep-wake cycle
- **H**ouse soiling
- **D**isorientation
- **A**lterations in activity levels
- **A**nxiety
- **L**earning and memory

Sordo et al (2021)

Disorientation

- **Spatial disorientation** (confusion about where they are)
- **Temporal disorientation** (confusion about what time it is)

Feline CD Symptoms

- **Changes in sleep-wake cycles**
- **House soiling**
  - Eliminate in sleeping areas or by eating areas
  - Eliminate outside the litter box
- **Inappropriate vocalization**

Feline CD Symptoms

- Altered interaction/relationships
- Altered interest in food
- Decreased grooming
- Changes in general behavior

Feline CD symptoms

- **Changes in learning and memory**
  - Forgetting commands
  - Forgetting previous litter tray training

- **Changes in activity**
  - Reduced activity
  - Aimless wandering or pacing

Common Older Cat Diseases That Could Cause Similar Symptoms

- Chronic kidney disease
- Hyperthyroidism
- Diabetes Mellitus
- Systemic Hypertension
- Osteoarthritis
- Deafness
- Meningiomas

Table 1. Mobility/Cognitive Dysfunction Questionnaire*

My cat	Yes	No	Maybe
Is less willing to jump up or down	☐	☐	☐
Will only jump up or down from lower heights	☐	☐	☐
Shows signs of being stiff at times	☐	☐	☐
Is less agile than previously	☐	☐	☐
Shows signs of lameness or limping	☐	☐	☐
Has difficulty getting in or out of the pet door	☐	☐	☐
Has difficulty going up or down stairs	☐	☐	☐
Cries when picked up	☐	☐	☐
Has more accidents outside the litter box	☐	☐	☐
Spends less time grooming	☐	☐	☐
Is more reluctant to interact with me	☐	☐	☐
Plays less with other animals or toys	☐	☐	☐
Sleeps more and/or is less active	☐	☐	☐
Cries out loudly for no apparent reason	☐	☐	☐
Appears forgetful	☐	☐	☐

It can be difficult to differentiate between many of the changes caused by CDS and/or other behavioral/neurological diseases in old cats, and those caused by OA. In addition, it is not unusual for an individual cat to have multiple interacting conditions.

*Ensure there have been no environmental reasons for the change(s).

Gunn-Moore (2007)

Management of Cats with CDS

Environmental Enrichment

- Extra toys
- Increase the amount of time you spend with the cat
- Increase play interactions with the cat
- Provide hiding places
- Elevated sites
- Puzzle feeders

Introduce changes to your cat’s environment gradually, so as not to confuse them!

Environmental Adjustments

- **Avoid placing food and water on high surfaces**
  - Difficult to access
  - Provide a ramp up to the surface
- **Raise food and water bowls up slightly from the floor**
  - Makes them easier to reach
  - Especially arthritic cats

Environmental Adjustments

- **Provide several comfortable beds**
  - Easily accessible areas
  - Heated beds for added comfort

- **Provide large, low-sided litter boxes**
  - Place them in easily accessible locations
  - Keep existing locations and add new ones

Environmental Adjustments

- **Provide soft litter**
  - Sandy-types are softer on the paws
- Let cats **out via a door** rather than a cat flap
- Area for **peace and quiet** away from other pets/people

Environmental Adjustments

- **Avoid introducing a new cat or dog**

- **Use pheromones to help reduce anxiety**
  - Feliway® Classic
  - Feliway® Multicat or Feliway® Optimum (If multiple cats)

Dietary Supplements

- **Aktivait Cat**
  - **DO NOT use canine form** due to alpha-lipoic acid content
    - Toxic to cats
- **SAM-e**
  - Novifit
  - Denosyl
- **Senilife**
- **Reservatrol**
  - A polyphenol that comes from the skin of red grapes and some other berries and peanuts
- **Proanthozone**

Dietary Management

- Switch to diets higher in antioxidants
  - Hill's Prescrition Diet Kidney + Mobility, k/d j/d
  - Nestlé Purina Pro Plan Age 7

Prescription Medications

- **Selegiline**
  - 0.25-1.0 mg/kg PO q 24 hours
  - FelineVMA supports the use of this drug
  - Beware of drug interactions!
- Propentofylline (Not available in US)
  - 12.5 mg/cat PO q 24 hr.
- Buspirone 0.5-1mg/kg PO q 12 hr.
- Fluoxetine 0.5-1.3 mg/kg PO q 24 hr.

Other Complimentary Therapies

- Nutraceuticals
  - Zylkene
  - Composure
- Compression garments
- Aromatherapy
- Herbal supplements
- Acupuncture
- Acupressure
- Massage
- Physical therapy

Take Home Points

- One needs to
  - Recognize the symptoms of CDS
  - Start treatment EARLY in the disease
- Client education is essential
  - Start educating before cats and dogs reach their senior years
- Be sure to work-up and treat any co-existing diseases first

Goals are to…

- Slowwww the progression of disease
- Maintain QOL for BOTH the patient AND the client

References Available Upon Request


JUST
THANK
YOU!

Hill's®
Transforming Lives™

Nutrition Tips and Tricks for the Senior Patient: Diets and Esophageal Feeding Tubes

ALLY SPTIZ, DVM
(RESIDENCY TRAINED IN SMALL ANIMAL CLINICAL NUTRITION)

Nutrition Tips and Tricks for the Senior Patient: Diets and Esophageal Feeding Tubes

Ally Sptiz, DVM, (Residency Trained in Small Animal Clinical Nutrition)

December 7, 2024

- Although many Hill's therapeutic diets are labeled for a specific disease process or condition, it is important to understand the nutritional profile to maximize use of each diet for senior patients.

- Understanding protein, fat, and carbohydrates on a metabolizable energy basis (% ME) is essential when comparing and choosing the best diet for canine and feline patients.

- Hill's Prescription Diet Canine and Feline Gastrointestinal Biome canned or dry promotes healthy stool in as little as 24 hours.

- Diets for overweight pets such as Hill's Prescription Diet Canine Metabolic + Mobility canned and dry have more fiber to increase satiety; total dietary fiber is not the same as crude fiber and should be used to compare diets with different fiber profiles.

- Hill's Prescription Diet Canine Derm Complete canned and dry is a limited ingredient food with a single, intact animal protein (egg); it is useful in older and younger itchy patients as there is an adult and puppy option.

- Hill's Prescription Diet Canine z/d canned and dry does not have ActivBiome+ but Hill's Prescription Diet Canine z/d Low Fat canned and dry with ActivBiome+ is hydrolyzed nutrition for dogs with concurrent food and fat sensitivities.

- Hill's Prescription Diet Canine and Feline k/d + j/d dry is an option for elderly pets with chronic kidney disease and concurrent joint disease.

- Hill's Prescription Diet Canine c/d Multicare Low Fat canned and dry is formulated to help dissolve struvite stones and lowers risk for formation and recurrence of calcium oxalate stones, while improving tolerance in patients with fat sensitivities.

- Hill’s Prescription Diet Canine and Feline ONC Care canned and dry has exceptional taste and is designed to be nutrient and calorie dense; critical care cases or patients with inadequate nutrition can benefit from this diet.

- Esophageal feeding tubes are useful in cases with inadequate caloric intake; other benefits are controlled water intake and easier medication administration.

- Many Hill’s therapeutic diets can be used to make slurries for esophageal feeding tubes and energy density should ideally be 1-2 kcal/mL if possible.

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