

# What's the Appropriate Diet for Cats?

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## Objective

### To bring some reasonable balance when talking about

1. Feeding behavior
2. Form of diet
3. CHO digestion
4. CHO metabolism
5. "Optimal" macro nutrient profile

### What is a carnivore? Taxonomically

1. includes over 280 species of placental mammals.
2. have teeth, claws, and binocular vision adapted for catching and eating other animals.
3. many hunt in packs and are social animals, giving them an advantage over larger prey.
4. include meat eating (cats and pennipeds), meat & plant eating (dog, raccoon, bears) and even a few primarily plant eating species, such as the giant panda.

### What is the domestic cat's feeding behavior?

1. Do not display a regular daily rhythm of
2. Sleep /wake
3. Eating / drinking
4. Activity cycles
5. Eat 10-20 small meals day and night
6. Lone hunters
7. Predatory drive is strong
8. Will stop eating to catch another - will continue to hunt down when satiated
  - a. Fox in the house – kills all but eats 1
9. Empty intestinal digesta of a herbivore before consuming - rarely eats colon
10. Mouth feel (physical form, odor, taste) is very important
  - a. Neg = sticky, powdery or greasy textures
  - b. Pos = smooth, slippery

## Feral cat diet – Estimates

60% young rabbits/hares; 40% small rodents 10% birds, frogs, reptiles, insects (Fitzgerald 1988). In urban areas : more garbage than small animals and birds (McMurry 1941). Garbage = meat, veg and bread (Tabor 1983). In the bush; rabbit, mice, marsupial and carrion (Coman 1972).

### What flavors do cats prefer?

Taste for animal fat and protein hydrolysates (digest), meat extracts and certain free AA (ala, pro, lys, his, leu). Absence of functional sweet taste receptors so not attracted to sugars. Not attracted to plant derived flavors (glutamic acid or MCT) although O report cats eat some fruits (melons, pumpkin).

Prefer moist food fed at or near body temp (101 F) most like a fresh kill. Food preference is fixed within 1st 6 months of life

### What is an obligate carnivore?

Nutritional requirements that are only met adequately by a diet containing animal tissues (organs, skeletal meat, viscera, fat) .... namely: Arginine, Methionine/Cystine, Taurine, Vitamin A, Vitamin D3, Niacin, Arachidonic acid.

1. These nutrients are not found (or very low) in the plant kingdom
2. Precursors may be found in plants but obligate carnivores lack or insufficient enzymatic conversion rate sufficient to meet need.
3. Ratio of intestine to body length is shorter than omnivores but have greater villus height
  - a. Overall absorptive capacity = 10% < than dogs

## Water

1. Thought to be descendant of African wildcat
2. a desert dweller
3. Can survive on less water than dog - will fail to consume more water < 4% BW dehydration
4. Compensate with a highly concentrated urine

5. Consume 1.5 to 2 ml water/g of food dry matter which is similar to water content of typical prey
  - a. Low compared to 1 ml/ kcal ME for omnivores
6. Feeding canned or wet food = 0.8 ml water / Kcal ME -> slight diuresis & may not drink from water bowl.
7. Feeding dry food = 0.03 ml water / Kcal ME -> will drink from water bowl.

#### **Carbohydrate (not fiber)**

**True .. AAFCO and NRC do not state a minimum or maximum daily requirement for “carbohydrate”**

1. Which does not mean a zero CHO diet is recommended
2. Which does not mean they cannot digest and metabolize carbohydrate
3. Cats fed 6 different properly cooked grains including corn and rice (43-53% of diet) averaged were >93% digestible. (de-Oliveira et al. J Anim Sci. 2008)
4. Cats do need glucose and derive most of it from gluconeogenesis from protein and fat in the immediate absorptive phase after a meal.
5. Hence frequent meals of protein and fat to maintain blood glucose

**Digestion is >98% @ 50% grain diet but Cats have demonstrated a CHO ceiling due to:**

1. Lack salivary amylase
2. Reduced pancreatic amylase activity (5% of dogs) and non-adaptable
3. Reduced intestinal disaccharidases activity that is non-adaptable
4. Absorption from Intestines is limited
5. Low rates of intestinal glucose uptake
6. Hepatic metabolism is limited due to Low glucokinase: High hexokinase ratio which results in low stores of hepatic glycogen relative to omnivores

**What nutrient profile would cats select if offered choices? Hewson-Hughes, A. K. et al. J Exp Biol 2011**

1. Designed 9 different feeding experiments using adult neutered domestic short hair cat housed at the Waltham Centre for Pet Nutrition in England.
2. Objective: to disentangle the complex interactions between dietary protein, fat and carbohydrate in the control of intake.
3. Six dry diets and six wet diets were fed using variable concentrations of protein, fat and carbohydrate expressed as a percent of energy consumed (% kcal)
  - a. Fixed fat with reciprocal protein and carbohydrates
  - b. Fixed protein with reciprocal fat and carbohydrates
  - c. Fixed carbohydrates with reciprocal fat and protein
4. Nine different feeding trials with:
  - a. Protein ranging from 17 to 68 % of Calories
  - b. Carbohydrates ranging from 2 to 56% of calories
  - c. Fat ranging from 22 to 57% of calories
  - d. Both dry and canned forms were tested

**Overall “self selected” energy profile - cats selected a dietary energy profile of**

- 52% kcal from protein
- 36% kcal from fat
- 12% kcal from CHO

#### **Diet CHO ceiling**

There is CHO ceiling above which cats will not consume more food become protein and fat energy deficient. Occurred at 72 CHO Kcal/day = 4 g CHO/kg BW/d which Calculates out to be ~30% grain in the diet.

Excess (undigested) dietary CHO will go to colon increase VFA and lactic acid -> lower pH in the large bowel. Fecal 6.3 or less is suggestive whereas fecal 6.0 or less is “taken as proof” of CHO dysfermentation. Recommended max 5 g/kg BW/d or 24% cooked starch in diet DM which back calculates to be 20% CHO calories or a 40% grain in the diet.

#### **Summary of data**

It appears that cats should be fed a 15-20% CHO calorie wet diet frequently based on:

- Self-selecting feed intake studies
- in vivo small bowel digestion studies
- in vivo fecal pH studies
- Feral cat studies

Compared with dog is lower but clearly some CHO (grains) can be fed to cats. Wide variety of diet available (5 – 40%). “No grain” does not equal “No Carbohydrate” diet as starch is starch regardless for origin (corn vs. green pea vs. potato – all the same).

When is feeding higher (>20%) CHO calories necessary? Obesity and weight control .....

Controlled Feline Feeding Trial #1- Concluded: High fat diets presented a greater risk for obesity vs. high carbohydrate diets.

Controlled Feline Feeding Trial #2 - Concluded: high dietary fat, but not carbohydrate, induces weight gain and increases body fat. Also measured serum insulin, glucose, TAG, ghrelin and leptin q 2 wks. and concluded: High carbohydrate diets did not increase body fat and did not increase serum glucose and insulin levels.

How much to feed the cat? The amount necessary to maintain optimum body weight and condition (BCS 4-5/9 = 15-20% body fat) which can differ significantly (+/- 50%) between cats.

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