SKINNY OLD CATS: SARCOPENIA AND CACHEXIA
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INTRODUCTION
Aging is a complex process reflecting increasing damage at the level of the cell as well as the entire body/organism. The organism may be affected by genetics, social environment, nutrition, and the occurrence of age-related diseases. Cellular aging, on the other hand, includes progressive accumulation of sublethal injury (e.g., from free radical damage), resulting in either cell death or diminished capacity of the cell to repair itself. We can impact these changes to some degree through nutritional intervention. As cats age, weight loss is common. In fact, geriatric cats are more likely than adult cats to be underweight. There are a number of reasons and mechanisms for this, some of which are associated with “normal” aging. Weight loss, to the point of poor body condition, is a risk factor for illness and death in humans as well as in cats. 1-4

THE SKINNY ON WEIGHT LOSS
Obesity is an epidemic in young and senior adult cats (i.e., < 12 years of age) are prone to overweight or obesity as their maintenance energy requirements (MER) decrease without concurrent decrease in energy intake. Lean body mass, (LBM, skeletal muscle, bone, skin and organs), decreases in cats with advancing age, just as it does in other species. Because LBM is a primary driver of metabolism, decreases in muscle and activity result in weight gain. Obesity is a risk factor for manifesting diabetes mellitus and arthritis in predisposed individuals.

However, about 15% of cats over 12 years of age have a low body condition 5,6 and after 14 years of age, cats have a 15 times greater risk for being under condition 6. In a study of 90 healthy cats over seven years of age that were followed until death, an average weight loss of almost 50% of adult weight was found 7,8. Additionally, this study showed an association between longer life span and less weight loss. In fact, further analysis showed that each 100g loss of weight increased the risk of death by 6.4%, each 100g loss of lean body mass increased the risk of death by 20%, but that each 100g loss of body fat increased the risk of death by 40% 7. It appears, therefore, that some loss of weight is part of normal aging, and is not caused by illness but that we may be able to address it nutritionally to some degree, potentially improving longevity as well as quality of life.

CLINICAL IMPLICATIONS
The loss of LBM has profound effects on survival as well as immune function, wound healing and strength in people. In companion animals, studies have identified decreased survival as being associated with thin body condition.1,2,9 Weight loss, anorexia, weakness and a perceived poor quality of life are reasons for clients to seek euthanasia. Being slightly overweight improves outcomes for people with heart disease and cancer. In one study of cats with large cell lymphoma, those that lost > 5% body weight during treatment had a significantly shorter survival time than those who were able to maintain their weight 10. Other cancer patients with a slightly increased or ideal BCS survived up to six times longer than underweight cats 11. Cats with higher BCS and CKD, lived longer than those with lower BCS. 12 Similarly, cats with heart failure had best outcome if they were normal (or slightly increased) weight before treatment rather than being underweight or obese 13.

NORMAL WEIGHT LOSS & SARCOPENIA IN APPARENTLY HEALTHY OLD CATS
Sarcopenia, “poverty of flesh”, is an age-related loss of lean body mass. It is not caused by disease and is a gradual process, progressing with aging. Initially it is inapparent, because increases in body fat maintain, or even cause increases in body weight. Loss of muscle can occur without fat loss or a decrease in body condition score (BCS) and individuals can retain an obese or overweight BCS yet be under muscled (“sarcopenic obesity”). Therefore, both subjective BCS and muscle condition scoring (MCS,
Table 1) should be performed in all cats, in order to evaluate fat mass and lean mass independently of each other. In humans, a calculated lean mass index has been suggested as being more relevant than body mass index (BMI). Similar to humans, a mean loss of 34% LBM has been reported in a group of geriatric cats over eight years of age. Sarcopenia is associated with increased morbidity and mortality in cats. They manifest sarcopenia to lesser or greater degrees, therefore loss of weight and especially loss of muscle should be investigated before attributing it to natural causes.

Table 1. Muscle condition scoring criteria

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<tr>
<th>Score</th>
<th>Assessment of Muscle Condition</th>
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<tr>
<td>0</td>
<td>On palpation over the spine, scapulae, skull, or wings of the ilia, muscle mass is severely wasted</td>
</tr>
<tr>
<td>1</td>
<td>On palpation over the spine, scapulae, skull, or wings of the ilia, muscle mass is moderately wasted</td>
</tr>
<tr>
<td>2</td>
<td>On palpation over the spine, scapulae, skull, or wings of the ilia, muscle mass is mildly wasted</td>
</tr>
<tr>
<td>3</td>
<td>On palpation over the spine, scapulae, skull, or wings of the ilia, muscle mass is normal</td>
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Numerous other factors besides sarcopenia can contribute to muscle and weight loss. Maintenance energy requirements vary with age, genetic potential, health status, and gender (intact or altered). MERS decrease with age in humans, dogs and rats. In cats, while MERS decrease until about 10-12 years of age resulting in weight gain, MERS per unit body weight actually increase after this age. In addition, studies in geriatric cats over 12 years of age show that fat digestibility decreases with age.

Studies in geriatric cats have shown a reduced digestive ability and this may contribute to their increased MERS. Perez showed a reduced ability to digest protein in 20% of geriatric cats with about 33% having a significant reduction in their ability to digest dietary fat, as high as 30%. Another study revealed similar results reporting an 8% average reduction in energy digestion and 6% in protein digestion. Micronutrient absorption is also decreased in healthy cats: potassium, phosphorus, sodium, choline, B vitamins and Vitamin E.

This is of clinical relevance when we try to design the optimal nutritional regime for our older feline patients: protein and fat restriction may well be contraindicated. Especially if underweight, older cats will benefit from a more energy-dense, highly digestible diet to help offset these age-related digestive and metabolic changes. Thus, it appears that some loss of weight is part of normal aging, is not caused by illness but that we may be able to address it nutritionally to some degree, potentially improving longevity as well as quality of life.

Factors resulting in stress, such as environmental or social changes may cause inappetance. Difficulty comfortably getting to food, often due to arthritis, but possibly from diabetic neuropathy or interference by other individuals can result in muscle and/or weight loss. A decline in taste, smell or vision may cause inappetence. Pain and nausea may interfere with eating: pain is commonly associated with arthritis and oral disease (periodontal disease, root exposure, odontoclastic resorptive lesions, stomatitis and oral masses).

In general, “senior” diets are designed for mature, overweight cats. As such, they are reduced in calories and not appropriate for thin cats. They may also not be of sufficient digestibility to meet the protein and
fat needs of a thin geriatric cat. Ascertaining the type and quantity of food fed is critical in managing an underweight, elderly cat. Key to determining the appropriate diet for any given individual is a nutritional assessment. This should include determining not only body weight at every visit, but also identification of body composition, most practically by using a body condition score. Percentage weight change determination is helpful in detecting trends and alerting both the practitioner and the client to insipient (or blatant) physiologic alterations. Use of a simple diet history form (http://www.wsava.org/nutrition-toolkit) provides important information by revealing not only food fed, but also brand and quantity and treats or supplements that this patient may have access to.

In the last decade, an extensive study evaluating feeding the healthy, older cat, looked at whether the use of dietary antioxidants (Vitamin E, beta carotene) alone or in combination with a prebiotic (chicory root) and a blend of oils to supplement n-3 and n-6 fatty acids had a beneficial effect on the health and longevity of cats when compared to a complete and balanced diet. Ninety healthy cats over seven years of age (grouped into 7-9, 10-12 and 13 + years of age at time of start) were studied in a controlled environment for five years. As described earlier and as expected, all cats lost weight as they aged, but cats in the fully supplemented group lost less weight than those in the other two groups. Other beneficial effects noted were improved LBM scores, improved fecal microflora, fewer diseases (notably gastrointestinal) during the study and longer life.

Management of weight loss and sarcopenia in the apparently healthy old cat

Weight loss in older cats can be a frustrating and worrying change. While possibly normal in the older individual, it is of great importance to the cat and the client that the cause be determined. Optimising oral and dental health cannot be over-emphasized, yet clients may express concern about anaesthetising the elderly cat. Several papers have looked at risk factors for anaesthesia. Proper staging of the patient and taking appropriate precautions were found to minimize perianesthetic complications; age was not found to be a risk factor (Table 2). Reminding our clients that the majority of anaesthetic procedures in human medicine are performed on elderly patients, may provide reassurance that safe anaesthesia is possible allowing their cat to enjoy the benefits from the dental or other procedure if appropriate pre-anaesthetic precautions and intra-operative monitoring are undertaken.

Table 2: ASA physical status classification system

The ASA classification refers to the American Society of Anesthesiologists’ classification system, based on the physical status of the patient. Five categories are defined as follows:

- Class 1: Normal, healthy patient
- Class 2: A patient with a mild systemic disease
- Class 3: A patient with severe systemic disease
- Class 4: A patient with a severe systemic disease that is a constant threat to life
- Class 5: A moribund patient not expected to survive without the operation

Other causes of pain should be worked up. Lameness is not a common clinical sign of arthritis in cats. The signs are often insidious or attributed to ageing. They include inappropriate elimination (often adjacent to the litter box), decreased grooming, developing an antipathy for being combed, reluctance to jump up or down, sleeping more, moving less, withdrawing from human interaction, and possibly even hiding. When activity monitors have been attached to cats’ collars, activity counts increased with non-steroidal anti-inflammatory drug (NSAID) treatment suggesting alleviation of musculoskeletal discomfort. Thus, if the history exposes evidence of decreased mobility, adaptations for getting to favourite places, thickened nails, etc., then it is reasonable to recommend that radiographs be made and range of motion assessed of affected joints.
If physical evaluation fails to reveal a cause for the weight loss, before attributing this problem to sarcopenia or considering more intensive testing, the cat’s environment should be considered. What may not be threatening to us, or even to the cat in the past, may be perceived as a source of stress in the older, less secure cat. A discussion about ease of access to all-important resources may find a crucial defect that may be readily corrected.

After these evaluations, when no evidence of disease, pain or stress is found, then nutritional management may prove beneficial. Both the weight loss and muscle wasting need to be addressed, as cats utilize their protein stores for a source of energy. The caloric requirements should be calculated in order to determine the amount of food required (http://petnutritionalliance.org/cat.php). For weight gain, increase the calculated amount by 1.4-2.0X. While canned food may be preferable in providing more moisture, some cats are reluctant to eat it. If a change is desired, it must be made gradually with the client monitoring that the cat is eating enough food. Dry food should be available at all times, in quiet locations that are readily accessed by this individual. If a cat prefers to eat only a small quantity, eating canned food may not be appropriate as it is much less calorically dense than dry food is.

Due to the possibility of a reduced digestive ability, a high energy, highly digestible diet with an increased protein content may be appropriate. Diets should contain approximately 10-13 g protein/100 kcal metabolizable energy to provide enough protein. Older cats require 5-6 g of protein/kg and insufficient dietary intake results in muscle catabolism. If cats are eating only small amounts of food, a higher percentage of calories from protein may be needed to meet their needs. Kitten diets may be an appropriate choice as they are fortified with micronutrients and are highly digestible. For a patient with apparent maldigestion such as seen with chronic small intestinal disease, folate and cobalamin supplementation has been shown to be beneficial (folate: 0.5-1.0 mg/cat/day PO X 1 month; cobalamin 250 mg/cat SC once weekly X 6 weeks).

WEIGHT LOSS ASSOCIATED WITH CACHEXIA IN OLDER CATS

Cachexia refers to weight and muscle loss secondary to chronic inflammation or disease. The causes of cachexia are not fully understood. Inflammatory mediators, oxidative stress, up-regulation of the ubiquitin-proteasone proteolytic pathway and hormonal mediators appear to play a role in this complex process. Heart failure, neoplasia, advanced kidney disease and failure are often associated with cachexia. Muscle loss is more rapid and therefore, more obvious in cachexia compared to sarcopenia and may also include fat loss. Morbidity and mortality increase when LBM is catabolized.

When inappetence due to illness, and malnutrition from an inappropriate diet or an insufficient quantity of food are factored in, the results can be catastrophic. Nutritional support is critical but, unlike sarcopenia, reversal of the loss of LBM is unlikely.

Management of cachexia in older cats

The most effective approach to cachexia is through early treatment of disease and nutritional intervention directed towards preventing muscle wasting. As older cats are predisposed to those conditions in which cachexia occurs, a goal in this population is to achieve and maintain a slightly higher BCS (e.g., 6-7/9 or 4/5) as this appears to reduce the risk for mortality.

At the present time, there are no antitocabolic drugs that have been shown to be effective for the treatment of cachexia. Medical therapies focus on treatment of the underlying medical problems to help the patient feel well, to control nausea and alleviate pain. Appetite stimulation using cyproheptadine (1 mg/cat PO BID), or mirtazapine (1.88 mg/cat PO q 24-48h) may help jump-start a cat’s appetite, but one must pay attention that the total calories consumed are adequate. If a cat is eating...
but the dietary intake is insufficient, supportive feeding (assisted syringe feeding or tube feeding) must be considered.

As mentioned regarding weight loss of non-cachectic origin, one should address mobility, ease of access, stress, and palatability. With cancer, especially when being treated with chemotherapy, the sense of taste is altered in humans. Presumably the same occurs in cats, hence what previously was flavourful to an individual, may no longer appeal and other diets will need to be tried. It is likely that with metabolic disease, such as cancer, heart failure or chronic kidney disease, cats may require even more protein in the face of muscle catabolism.

The omega-3 fatty acids eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) from fish oil appear to have some beneficial effects in human cachexia. As they have anti-inflammatory effects in cats as well, it may be reasonable to incorporate them into therapy. A dose of 40mg/kg of EPA and 25mg/kg DHA (approximately 1g fish oil per 5kg ideal body weight/day) has been suggested for any animal with cachexia. While antioxidants have not been studied specifically in this context in cats, oxidative stress plays a role in cachexia. As was mentioned earlier, healthy cats receiving Vitamin E, beta carotene, a prebiotic and fatty acids in the diet and longevity study, lived approximately one year longer and preserved their BCS and lean mass.

Inappetance, sarcopenia and cachexia occur commonly in old cats. Lean body mass is preferentially lost and is associated with higher morbidity and mortality. Approaching senior and geriatric stage of life with a slightly increased BCS appears beneficial to survival and a better quality of life. Optimizing dietary protein intake is important as older cats have higher protein needs than adult cats do, especially when they have reduced digestive capacity.

SELECTED REFERENCES

COMPLETE REFERENCES AVAILABLE FROM THE AUTHOR
REFERENCES


