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Development of food preferences in cats

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Food preferences in cats are largely learned.[1] While the pet owner is the first line of defense, cats need to learn what is safe to eat and what foods are more nutritious than others. Several different types of learning are involved in the development of flavor and texture preferences in cats. These include perinatal learning, novelty, flavor-flavor learning, flavor-nutrient learning, hedonic contrast, and social learning. This article will focus on a few of these types of learning.

Perinatal Learning

Learning about foods and flavors begins very early, and for many mammalian species it starts with the maternal diet. Both prenatal and postnatal flavor learning have been shown in kittens, with the latter exerting stronger impact on later flavor preferences.[2] Perinatal learning provides a safe means for introducing offspring to foods that will be part of their adult diet after weaning and supports acceptance of these foods into the animal's diet.

Allowing kittens to stay with the mother until the end of weaning and allowing the kittens to have exposure to what the mother is eating will help the kittens mimic the mother's eating behavior. Offering the mother a highly nutritious diet comprised of foods with different textures and flavors will help model good feeding behavior for her kittens. This increases the likelihood for the kitten to grow up accepting a variety of complete and balanced foods.

Novelty

Novelty is the difference in response to novel or infrequently seen foods when compared to familiar foods. Feeding studies with well-socialized cats raised in enriched environments tend to show that they are neophilic, preferring the novel or infrequently seen food.[3,4] Neophobic responses are more likely when cats have very narrow food and flavor experiences or if the food has one or more sensory attributes that are extremely different from anything they have safely encountered before as food.[5] This can be the case even if the food is palatable and complete and balanced.

Of Note

- Food preferences are largely learned and not innate.
- Early experience with a variety of flavors and textures can help cats to accept a wider variety of foods.
- Social learning can influence food preferences of cats. Even more importantly, it can impact how much, what, and when cats are fed.

If a cat needs to transition to a different diet, for example when changing life stage or for a specific health condition, having had exposure to different types of foods early in life can make them more open to trying new foods. This can be less stressful for the cat, pet owner, and veterinarian. If a cat is resistant to trying new food, it can be stressful for everyone involved.

Social Learning and Feeding Behavior

Research findings show that there is a social component to feeding behavior in cats. Kittens, like the young of other species, demonstrate social influences on food preferences. Weanling kittens adopt their mothers' food preferences and initiate eating of a novel food faster in the presence of their mother who had a history of eating that food compared to kittens whose mother was not present.[6,7]

Observation learning, imitation, peer and/or parental influence, and teaching are all examples of social learning.[8] Dietary exposure and social influences, learned from other pets or pet owners, can impact cats' preferences for certain types of food, when they get fed, and how much they get fed, and other feeding behaviors. Social learning can also help explain some of the unique food preferences that pet owners attribute to their specific cats. Cat owners can readily relay examples of social learning about

food and feeding behavior in their cats but may not necessarily understand how they are contributing to the changes in their cat's feeding behavior.

One example of social learning involves inadvertent training of finicky eaters by cat owners. When a cat refuses to eat and the owner immediately, or very soon after the cat refuses a food, replaces it with a better alternative, they are effectively communicating to their cat that if you don't like the food, don't eat and I will replace it with something else. By establishing this type of contingency learning and similar ones, the cat gradually gains more control over their diet, even though they are not the one directly obtaining the food. In contrast, if the pet owner had chosen to remove the food and wait until the cat became hungry before offering the same food or waiting for several hours to offer a different food, the outcome would have been different.

Another example, even more frustrating for the pet owner, is where cats learn they can get their owners to give them their morning meal much earlier than their owners would prefer by engaging in any number of unwanted behaviors. Once this learning has taken place it becomes very difficult to unlearn because when the owner attempts to extinguish these behaviors by ignoring their cat, extinction burst is almost certainly to occur. Extinction burst is an escalation in the rate of those unwanted behaviors. This is a known outcome of the extinction process but unfortunately most cat owners will respond by giving their cat food, making extinction even more difficult. Automatic food feeders can help to reduce the unwanted behaviors, especially if the owner intentionally feeds a less attractive food than what is offered from the feeder and does so after the food is delivered by the feeder.

Social learning about food, specifically learning between pet cats and dogs and their owners, warrants more research attention than it currently receives because of the potential impact on health issues such as pet obesity.

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Appetite management in hospitalized dogs and cats

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Appetite is the manifestation of hunger and is the body's normal response during periods of decreased energy intake.[1] Hyporexia or anorexia is a maladaptive response resulting in a reduction or absence of food intake despite inadequate consumption of energy and might lead to malnutrition if untreated.[1] Hospitalized patients are at risk for malnutrition as acute (and chronic) illness can impact nutritional intake and appetite.[2] Malnutrition has been correlated with morbidity and mortality, increased length of hospital stay, and increased medical costs.[2,3,4] In one study, dogs and cats were more likely to be discharged from the hospital when they achieved nutritional goals closer to their resting energy requirements.[4]

Recognition and treatment of malnutrition should be prioritized in hospitalized dogs and cats. Thus, nutritional interventions should be considered when a patient has been anorexic or hyporexic for three or more days or if anorexia is expected to last for at least that period (e.g., an animal with severe acute pancreatitis who is hospitalized for treatment).[1] It is important to note that many hospitalized patients are hyporexic or anorexic at home prior to hospitalization, and this should be accounted for when evaluating the patient's risk of malnutrition.

Interventions that should be considered to increase voluntary food intake in hospitalized patients are highlighted in **Box 1**. An important first step to getting a patient to eat is to treat the underlying disease causing a poor appetite. An appropriate diagnostic plan should be implemented and abnormalities surrounding volume status, hydration, nausea, infection, pain, and acid-base/electrolyte abnormalities should be corrected as soon as they are identified. Once interventions have been made to address the underlying disease, specific nutritional interventions should be carried out to encourage voluntary consumption of food. Cats, for instance, tend to eat better when they can smell their food and warming up a wet diet before it is offered might make a significant impact on the cat's appetite.

Of Note

- Malnutrition is common in hospitalized patients and can be associated with morbidity, mortality, increased length of hospitalization, and increased medical costs.
- Interventions to increase appetite in hospitalized dogs and cats include clinical interventions and nutritional interventions.

When initiating feeding in hospitalized patients, it is generally recommended to start with about 25% of the patient's resting energy requirements (RER) for current weight, and then gradually work up to 100% of the patient's RER over approximately four days. The time will be dependent on how well the dog or cat eats and the patient's tolerance to feeding. Resting energy requirements in kcal/day is equal to 70 x (body weight in kg)$^{0.75}$, and current weight should be used for hospitalized patients

Pharmacologic agents that stimulate appetite may be considered if addressing the primary underlying disease and providing nutrition specific interventions fail to promote voluntary food intake. The use of appetite stimulants as the primary or sole means of increasing food intake is not recommended.[1] Appetite stimulants that may be considered may include but are not limited to cyproheptadine, mirtazapine, and capromorelin. It is important to note that the efficacy of appetite stimulants may be unpredictable, and they may not increase food intake to a level that meets the patient's target energy requirements.[1]

Box 1. Clinical and Nutritional Interventions for Hyporexia and Anorexia in Dogs and Cats

General Clinical Interventions

- Normalize blood pressure
- Treat dehydration
- Correct electrolyte imbalances
- Provide anti-emetics and prokinetics (if indicated)
- Provide analgesia in painful patients
- Consider weaning off mu-opioid receptor analgesic drugs as well as lidocaine infusions, as soon as pain is well controlled, in order to reduce nausea

Nutrition Specific Interventions

- Remove any uneaten food after about 20 minutes
- Avoid feeding around times of unpleasant procedures
- Try different texture food (dry kibble and different textures of canned food, etc.) to improve acceptance
- Remove barriers to eating (such as Elizabethan collars)
- Heat up the food before offering (can be really helpful for cats)
- Hand feed the patient
- Feed in a quiet location
- Feed the patient outside when the weather is nice (especially true for dogs)
- Have the pet owner bring in the patient's favorite food
- Have the pet owner visit and feed the patient
- Consider an appetite stimulant
- Consider a feeding tube

For patients with prolonged anorexia or more severe disease, a feeding tube is indicated as a means to provide enteral nutrition. Nasogastric or nasoesophageal tubes are easy to place, inexpensive, and do not require general anesthesia. Esophagostomy or gastrostomy tubes may also be considered although both are more suited for long-term assisted feeding and require general anesthesia. Parenteral nutrition may also be considered in animals who may not tolerate enteral feeding (irretractable vomiting or regurgitation or patients with neurologic disorders like a compromised gag reflex).

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Behavioral strategies to enhance food intake at home

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Caring for a hyporexic or anorexic pet at home can be particularly challenging for many caregivers. Feeding is one of the main ways in which people care for their companions and mealtimes are often associated with important social interaction, especially for dogs. In order to improve food intake, veterinary professionals will consider dietary modifications and potential use of medications to stimulate appetite, but consideration of the potential emotional and cognitive factors that can affect food consumption is also beneficial.

Assessing the problem

Does the pet show no interest at all in food in any form and at any time, or does it show interest in some foods at some times? It is not uncommon for clients to report that their pet is not eating their daily food ration, but the pet may be happy to consume treats. The approach to this dog or cat is going to be different from the pet that flatly refuses to consume food in any circumstance. Another helpful piece of information is whether the pet shows initial interest in the food and then fails to consume it or shows no interest at all. Finding out the detail as to what the problem actually is can be the key to finding an approach that works.

Considering emotion and cognition

Consumption of food is related to the physical sensation of hunger which can be influenced by an individual's emotional state. The neuronal mechanisms involved in the control of appetite and the involvement of the limbic system in this process are complex. Emotional motivations can be described as engaging or protective,[1] depending on the purpose of the behavioral responses that they are associated with. The engaging emotion of desire-seeking is involved in the process of gaining access to food, and protective emotions, such as fear, anxiety, pain, and panic-grief, can be associated with a decrease in motivation to eat. Cognition also plays an important part in the emotional response to food, and previous detrimental associations with the feeding process have the potential to decrease motivation to consume food in the future.

Of Note

- Feeding is not just a physical activity but also an emotional and cognitive one.
- It is important to create the right context, both social and physical, for food to be consumed.
- Do not only think about what the pet is eating but where, when, and with whom it is eating.

A behavioral medicine approach

A comprehensive healthcare approach to veterinary medicine involves equal consideration of physical, emotional, and cognitive health. Optimizing all three aspects of the patient's health will increase the potential to enhance their food intake. Within the home the aim is to deliver the most attractive food the pet can eat, considering health conditions, in the most attractive way. Caregivers should also ensure that the patient is emotionally as well as physically able to consume it.

Improving the emotional motivation to eat

Desire-seeking is the emotional motivation associated with engagement with food. Factors in triggering this system include the availability of food that meets the species-specific requirements of the patient in terms of nutrients, texture, and palatability and takes into consideration individual

Examples of behavioral considerations for inappetent patients

- Maximize engaging emotion at the time of feeding
  - Optimize the texture and palatability of the food – consider olfaction as well as gustation
  - Consider feeding smaller quantities at a time
  - Consider providing a predatory element to the feeding process for cats, e.g., through movement
- Minimize any potential triggers for protective emotion at the time of feeding (noises, visual stimuli, scents, social interactions)
  - Ensure that all cats have their own secure feeding location away from other pets
  - Assess canine relationships to ensure that each individual feels secure when in their feeding location and feed separately if necessary
  - Protect the food from being accessed by other pets in the household – consider microchip protected feeders
  - Locate feeding stations in quiet locations away from human disturbance
- Consider any potential cognitive factors by taking an accurate history regarding the pets eating behavior
  - Consider altering learned associations through behavioral modification
- Assess the pet's individual emotional health and address any emotional illness (as well as any physical health concerns)

requirements related to physical health and learned preferences. Other methods of increasing the motivation to engage with food while also reducing the risk of triggering protective emotions, which can limit such engagement, include optimizing the social and physical context in which the food is presented and supporting species-specific feeding behaviors. Carrying out an emotional health assessment of the patient is also important as emotional illness can be associated with a protective emotional bias and influence appetite.

Practical steps

Cats are solitary feeders – they acquire food alone through predatory behavioral sequences and actively select places of privacy and security in which to consume it. They are attracted to food items through olfactory as well as gustatory cues. They eat frequent small meals throughout the day. Dogs eat larger quantities of food at a time and are social feeders. They work together to acquire their food and can eat in a communal way. However, they can still react to social tension by reducing their food intake and any perception that their access to food is associated with potential danger will risk reducing their food intake.

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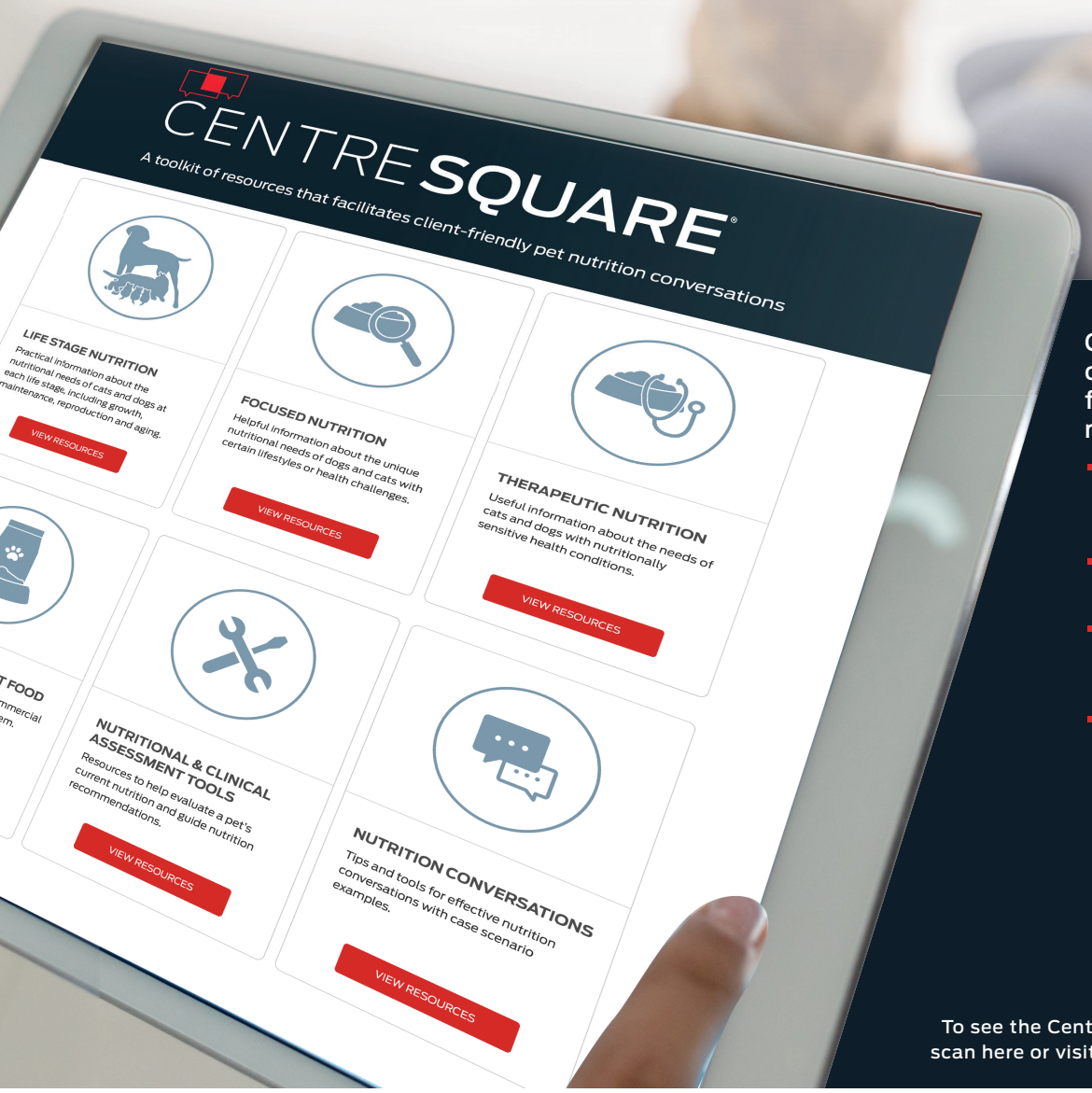

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