Why is it so critical to understand body postures in dogs? There are several reasons why this is an important topic with any discussion of dog behavior. By understanding how dogs communicate we can diminish the amount of miscommunication that occurs between people and dogs, it can help us better predict future behaviors in the dogs we interact with, understanding how dogs communicate can help reduce the incidence of dog bites, and it can increase the enjoyment people can have in their relationships with their dogs.

Behavior evolves just as body type evolves. Behavior can change over time as a dog learns what behaviors work in a given situation and which do not. As a result the successful behaviors will flourish while those that are less successful will tend to fade. This evolution can be seen in the individual animal by observing body posture since this is the principle means by which dogs communicate.

The eyes, ears, tail, mouth and overall posture can give us the best indications of what dogs are trying to communicate. These structures can convey relaxation, anxiety, tension, or confidence and by understanding the subtleties of their expressions, much ambiguity can be eliminated.

Because aggressive can greatly influence the bond and attachment we have with our pets, an understanding of the progression of aggressive responses can help in minimizing exacerbation of problem behaviors. The “Ladder of Aggression” serves to provide a good model of how aggressive behavior can develop from relatively benign “calming signals” to more overt aggressive displays culminating in snapping and biting.
Fear-Based Aggression: 
I’m Afraid of You so I Would Like to Eat You

John Ciribassi, DVM, DACVB 
Chicagoland Veterinary Behavior Consultants 
Carol Stream, IL

Aggression is the most common behavior problem presented to veterinary behaviorists followed anxiety related disorders (separation anxiety, phobias). Traditionally, dominance aggression is most often diagnosed, especially when evaluating owner directed aggression. As a result of the label “dominance” being applied in these cases, owners were often directed to establish themselves as higher ranking over the dog through the use of a variety of physical means (punishment, alpha rolls, leash hangs, pinch and shock collars, etc.). Escalation of aggressive responses often followed this approach. By examining the situations in which the aggression occurs, body posture exhibited by the dog and evaluating the early history of the behaviors it becomes evident that not all aggression is related to a question of dominance hierarchy. In many, if not most, of these cases a definite fear component seems to be the driving force behind the aggressive displays. This presentation is meant to clarify terms, differentiate possible diagnoses of aggression and offer thoughts on treatment of fear associated aggression.

Aggression is a normal canine behavior when displayed in the proper context. As a tool, aggression is utilized by dogs for a variety of purposes such as acquisition of food, defense of resource (food, territory, mating access), establishment of pack hierarchy, and self defense when threatened. In addition, submissive displays (averting stares, exposure of the underbelly, urination and retreat) are often utilized when a dog is presented with an overwhelming threat. If these signals are not recognized, a subordinate individual may be forced to rely on aggression (growling, barking, snarling or biting) as a last resort.

When examining these behaviors in the context of human-canine interactions, several factors must be considered. Do dogs and humans communicate in the same manner? While both are social species, methods of exchanging information differ. Often submissive signals are missed by observers not familiar with canine body language. As a result, dogs may be put in a position to use aggression when more subtle signals of submission are missed. Over time, learning can occur such that some dogs will totally abandon these submissive cues and instead more quickly elect to utilize these more offensive strategies to alleviate perceived threats.

Secondly, when punishment is used by humans as a means of exerting dominance, fearful dogs may be forced to respond aggressively while more confident animals may see the use of punishment as an incentive to engage in a so-called “arms race”. This involves raising the bar by showing higher and higher degrees of aggression in response to ever increasing levels of punishment. In addition, punishment is often applied in the inconsistently creating an increased anxiety in the fearful animal. Not knowing whether to expect reward or punishment, conflicting emotions result lowering the threshold of reactivity and increasing the chance the dog will resort to the use of aggression.

It also appears that fear can be highly inherited so that fearful, anxious or timid parents can produce a higher number of similarly behaved puppies in a litter. Combine this genetic component with the previously described communication breakdown and the true meaning of nature and nurture can be seen. In addition, failure to positively socialize during the sensitive period (up to 14 weeks of age) results in the genetic prophecy of fearful behavior being fulfilled.

**Diagnosis**

Body posture at the time surrounding the aggressive episode can be most valuable in determining etiology. Typical signs include:

- Tail dropped or tucked
- Ears laid back
- Dorsal Piloerection (evidence of arousal and non-specific for fear)
- Weight positioned over hind legs, head and neck lowered
- Gaze dorsally or via sideway glance at target
- Autonomic responses (urination, defecation, anal sac expression)
- Lip retraction (Vertical)

This may be the early presentation in a younger dog. Over time, the body language may suggest a more confident dog as it learns to deal with its fear and anxiety by adopting a more offensive strategy:

- Tail raised
- Ears forward
- Piloerection
- Weight shifted forward with head raised
- Staring directly at target
- Lunging at or chasing target
In a fearful animal, the target is often an unfamiliar person or can be a very familiar person when conflict exists. It can be sometimes seen where an initially offensive aggressive dog can revert to a more defensive body posture if the threat does not retreat or is sudden and overwhelming.

The situation often also helps determine etiology.

A typical presentation where fear is induced and has the potential to result in aggression includes:

- Approach from a stranger while on leash walk (leash can transmit owner anxiety, prevents escape by the dog, and also prevents canine specific communication in cases of Interdog aggression).
- Situations where persons are bitten on the hand while reaching toward the dog
- Being bitten on the backside or caudal thighs/feet (common with herding breeds)
- Secondary to punishment by strangers or owners
- Commonly seen with strangers entering the home or moving suddenly
- Young, mobile, active children. Unpredictability breeds anxiety in the dog and can cause biting to prevent movement.

Abuse can cause fearful behavior but commonly is displayed as fear toward a specific trigger as opposed to more generalized responses.

Dominant behavior over another individual normally is not seen until a dog reaches social maturity (12-18 months) whereas fearful behavior is often seen very early (at times as early as 8 weeks of age). Body postures associated with dominance are usually more offensive in appearance, they never have an early defensive presentation and is often associated with control of resources (food, space, items) or secondary to attempts to direct the animal’s behavior (commands, pushing, wiping feet, approaches, etc.). Dominant animals can also attempt to block movement of individuals. Dominant behavior can be very calculated and purposeful whereas fear responses are much more sudden and reactionary.

The successful use of aggression in a defensive situation can become a learned behavior. Over time, this response can be used in similar situations with greater confidence. As a result, the aggression can be displayed with increasing efficiency.

The principles of reinforcement and conditioning apply to the use of aggression.

Need to know the situation in which the aggression is occurring and the past history of aggressive behavior in order to make a proper diagnosis. Aggression is not static. Constant interaction of genetics and environmental influences can determine behavior at any one point in time.

Conflict aggression

- Often Diagnosed as Dominance Aggression
- Often show submissive posture. Not confident.
- Ambivalent body language (wagging tail while growling). May show “remorse” after aggression.
- Conflict occurs when put in confrontational situation or when cannot predict interaction.
- Dog learns to use aggression to get out of uncomfortable situation and is reinforced
- Owner directed aggression can occur in fear based situations:
- Inappropriate use of punishment
- Attempt to create owner: canine dominance structure in household
- Inconsistent interactions

Treatment of fear based and conflict behavior

The basis of treatment is to remove exposure to inciting stimuli, utilize counter-conditioning/desensitization and at times prescribe anti anxiety medication.

Removing stimuli – can be accomplished in several ways:

- Response Substitution - Discontinue all forms of punishment. Focus instead on distraction and redirection of inappropriate behavior to more appropriate responses which can be reinforced.
- Head Halter – Can be used to help facilitate response substitution with the use of an indoor drag leash. Head halter decreases arousal and allows safe, efficient, non-emotional interruption of problem behaviors.
- Avoid reinforcement of the behavior by withdrawing in response to aggression or giving positive attention (telling the dog, “it’s all right”).
- Have unfamiliar people ignore dog at first greeting to allow more time for the dog to assess the situation without feeling threatened.
- Identify any fear inducing triggers and avoid. For example, if house has several young children, isolating dog can avoid potentially negative interactions.
- Increase consistency of owner and dog interaction. Always give a command, wait for a response and reward.
- Avoid inconsistent, casual interactions by ignoring all attention seeking behaviors. Punishment should never be used.
• Often called “Nothing in Life is Free” or “No Free Lunch”

Counter conditioning
Counter Conditioning is the proactive relaxation techniques in all environments that the dog will be in without presence of offending stimuli.

Make use of a palatable treats made available by visitors (while still ignoring dog) as a means of accomplishing Classical Conditioning (associate visitors with positive results).

Desensitization
By using fear inducing triggers that gradually increase exposure while asking for, and rewarding, relaxed behaviors taught during the counter conditioning phase. Examples would be people entering the home or approaches from strangers or unfamiliar dogs.

Medication
The use of medication addresses anxiety issues which can accompany fearful behavior. Anti-anxiety medications are indicated when the degree of anxiety is great enough to interfere with the ability to learn as behavior modification techniques are applied. Common side effects include sedation, anorexia, gastrointestinal disturbances, increased aggression and anxiety.

Typical anxiolytics include

- Tricyclic antidepressants (TCA’s)
  - Clomipramine (Clomicalm) 2-4 mg/kg BID
  - Amitriptyline (Elavil) 1-3 mg/kg BID-TID

- Selective serotonin reuptake inhibitors (SSRI’s)
  - Fluoxetine (Prozac) 1 mg/kg SID
  - Paroxetine (Paxil) 1 mg/kg SID

- Benzodiazepines (BZD’s)

  Benzodiazepines are contraindicated due to potential for disinhibition of fear and possibly heightening the aggression.

Conclusion
Aggression, even when directed at owners, should not be automatically classified as Dominance Related Aggression. Often, the origin is a fear based response directed at unfamiliar people or, when conflicting signals are displayed by the dog’s owners, can also be directed toward more familiar people. Understanding the animal’s history and body language can be valuable in making the correct diagnosis. Treatment can include avoiding trigger stimuli, utilizing counter conditioning and desensitization (after grading the stimuli) as well as adding appropriate medication where indicated.
Feline Elimination Disorder:
Making Litter the Letter of the Law
John Ciribassi, DVM, DACVB
Chicagoland Veterinary Behavior Consultants
Carol Stream, IL

Medical causes – LUTD
- Cystic Calculi
- Crystaluria
- Bacterial Infection
- Neoplasia
- Interstitial Cystitis
- Viral, Stress Induced, Idiopathic

Medical causes – PU/PD
- Chronic Renal Failure
- Diabetes Mellitus
- Pyometra
- Estrus
- Hyperthyroid

Medical causes – fecal abnormalities
- Inflammatory Bowel Disease
- Dietary Intolerance
- Gastrointestinal Parasitism
- Neurological or Locomotion Abnormalities

Minimum database
- Urinalysis
- Urine Culture if indicated by U/A or blood work (ex. If Azotemic)
- CBC
- Chem. Profile
- Total T4

The goal in making a behavioral diagnosis is deciding between: marking vs. toileting

Minimum behavioral database
- Location of elimination and substrate - Marking typically occurs on vertical surfaces vs. horizontal
- Along walls, center of room, near windows or doors - Marking can often occur along perimeters
- Personal items vs. flooring - Horizontal marking can occur on personal items
- Type of elimination - Stool vs. urine (domestic cats do not mark with stool)
- Volume of urine - Marking commonly associated with small volumes
- Length of time problem has been occurring (Chronic vs. acute) - Can give an indication of prognosis
- Began as adult or kitten - Marking usually begins as kitten ages (after successfully using the litter box)
- Frequency of housesoiling incidents - increased frequency can be seen with marking behavior
- Number/Types of surfaces - marking commonly involves multiple surfaces
- Number of litter boxes and location – (Rule of Thumb: 1 box per cat + 1 and boxes should be separated in space to increase number of “core areas”
- Type of box - Covered vs. Uncovered
- Liners Used
- Size of box
- Litter types used (scented vs. unscented, clay vs. clumping)
- How long were the litters used
- Cat’s response to each litter
- Cats in household
  - Number of cats in household - Increased marking with increased # of cats
Correct ID problem cat - Use of fluorescin and non-toxic crayons

• Access to outdoor animal activity - Territorial marking near viewing areas
• Changes in household (people and pets)
• Routine change in the home prior to onset of problem
• Previous treatments and results

Behavioral causes
Toileting issues
• Substrate Preference - Cats will strive to reach proper substrate material.
• Substrate Aversion - Unacceptable litter type and can also occur secondary to LUTD or de-claw
• Location Preference - Cat finds an alternate location that it prefers in place of where litter box is located. Could be an area where cat feels safe or prefers secretive elimination.
• Location Aversion - Cat may have been frightened in the litter box area or had been attacked by another cat in the home while using the litter box.

Marking behavior
• Vertical Marking (Spraying) - Typical Posture with tail raised, quivering and urine projected in a horizontal fashion
• Horizontal Marking - not as common. Characterized by depositing urine on personnel items
• Middling (Fecal Marking) not suspected to occur in domestic cats.

Characteristics of marking
• Small Amounts of Urine
• Deposited on vertical surfaces (spraying) or on personal items (horizontal marking).
• Locations - No commonality of surface types (carpet, tile, wood, etc)
• Litter Use - Normal frequency of litter use. There is typically no issue with acceptance of litter. Remember, marking is for communication purposes.
• Elimination Posture - Spraying (tail raised and quivering)

Treatment options
• Toileting Issues
  • Place Litter Box in Cat’s Preferred Location - consider placing a litter box in this area in order to determine if the problem is location-related.
  • Litter Trial - Offer several litter choices and record frequency of use of each.
  • Confine with Preferred Litter - The goal is to increase the likelihood of the cat re-acclimating to the litter of choice
  • Prevent Access to Soiled Areas
  • Enzymatic Cleaners (Anti- Icky Poo, KOE)
• Litter Box Care
  o scoop daily
  o open litter boxes
  o no liners
  o clean with hot water only
  o 3-4” of unscented litter
• Appropriate Number of Litter Boxes - 1 box per cat plus 1 additional and distributed around the home.

It is important to gradually reintroduce cat to living area after proper interval of confinement. Slowly increase access to increased number of areas of the home. Be sure to provide additional litter boxes (with the preferred litter) in those areas to increase the likelihood of the cat using the box with the proper litter material.

Treatment options
Marking behavior
• Treat as for Toileting Issues - Evidence suggests that, even for marking behavior, proper litter management (#of boxes, dispersed throughout the home, proper litter cleaning protocol) can increase the tendency to utilize the litter box for elimination
• Medication
  o Clomipramine – 0.25-0.5 mg/kg bid
  o Fluoxetine – 0.5-1.0 mg/kg sid
• More effective, safer and less recidivism rates as compared to Diazepam and Buspirone
• Treatment Options
• Feliway – synthetic Feline Facial Pheromone. Apply to marked areas and prominent spots in the home. Available as a spray or a plug-in diffuser.
• Provide alternate marking opportunities
  o scratching posts or scratch boxes (in a proper location)
  o scratching combs (Cat A Comb)
• Manage relationship issues in the home - Address aggression issues between cats (indoor and outdoor) as well as relationship with human members of the household.
Resource Guarding:
What’s Mine is Mine and What’s Yours is Mine
John Ciribassi, DVM, DACVB
Chicagoland Veterinary Behavior Consultants
Carol Stream, IL

The focus of the discussion
- Which individual in a dyad (pair of animals) is considered to be dominant in the relationship?
- What criteria is used to make that determination (acquisition of resource vs. defense of resource)?
- Does aggression over the control of resources equate with dominance based aggression?

“Dominance: the assertion of one member of a group over another in acquiring access to a piece of food, a mate, a place to display, a sleeping site or any other requisite that adds to the genetic fitness of the dominant individual…” E.O. Wilson from Sociobiology: The New Synthesis Belknap Press of Harvard University Press, 1975. pg 257

Resource holding potential
“…..examples of "aggressiveness" are far more likely to represent long-term differences in subjective resource value.” Hurd PL.

“Dominance is a concept found in traditional ethology that pertains to an individual’s ability, generally under controlled conditions, to maintain or regulate access to some resource.” Karen Overall (“Clinical Behavioral Medicine for Small Animals” Mosby 1997. pg. 115

“Relative dominance is usually tested by giving two dogs access to one bone. The dog that gets possession is considered the higher-ranking dog.” Katherine Houpt (“Domestic Animal Behavior for Veterinarians and Animal Scientists” Iowa State U. Press 1982 pg 65)

“…a single bone was brought in, shown to the puppies, and laid between them….”
“…we defined a completely dominant animal as one that kept possession of the bone the majority of the time and was able to repossess it at will.” John Paul Scott and John L. Fuller (“Dog Behavior: The Genetic Basis” The University of Chicago Press 1965 pg. 156)

“The dominant dog shows a self-assured gait, a large, confident body posture, raised head, raised ears, large eyes and curled lips, all in different intensities and combinations depending upon the degree of dominance, superiority, or self-confidence.” Roger Abrantes (“Dog Language” Wakan Tanka Publishers 1997 pg. 93)

“…Once everyone knows his place, the alpha male need only move toward a lower-ranking male to have that individual hurry out of the way or otherwise signal submissiveness…” John Alcock (“Animal Behavior” Sinauer Associates, Inc. Publishers 2005 pg. 332)

Equal opportunity tests (EO tests)
“In equal opportunity tests (EO tests), both members of a pair had equal chance to seize the bone when it was tossed into the arena” Beach, Beuhler and Dunbar (“Competitive behavior in male, female, and pseudohermaphroditic female dogs.” J Comp Physiol Psychol. 1982 Dec;96(6):855-74)

Established possession tests (EP tests)
“During an EP test, the loser of the preceding EO test was given possession of the bone before the former winner was returned to the test arena” Beach, Beuhler and Dunbar (“Competitive behavior in male, female, and pseudohermaphroditic female dogs.” J Comp Physiol Psychol. 1982 Dec;96(6):855-74)

“…for a meaningful formal test of dominance, and to rule out differential motivation as a confounding factor contaminating the results, both animals must be motivated equally for the same resource.” Wendy van Kerkhove (“A Fresh Look at the Wolf-Pack Theory of Companion-Animal Dog Social Behavior” JOURNAL OF APPLIED ANIMAL WELFARE SCIENCE, 7(4), 279–285)

“A reasonable hypothesis is that the physical restrictions and limitations of captivity define environmental circumstances, engendering the formation of dominance hierarchies in wolves. Much the same might be said for dogs living together in a household.” Wendy van Kerkhove (“A Fresh Look at the Wolf-Pack Theory of Companion-Animal Dog Social Behavior” JOURNAL OF APPLIED ANIMAL WELFARE SCIENCE, 7(4), 279–285)

Possessive aggression
Aggressively guarding or maintaining control of a valued object (bone, chew item, stolen items or food, etc.). Guarding is considered to be normal behavior but can increase with opportunities for learning or can be exaggerated as a consequence of fear or defensive behavior/conflict.
“….food guarding was the most common circumstance for bites to familiar children (42%) and territory guarding for bites to unfamiliar children (53%). Behavioral screening of the 103 dogs examined revealed resource guarding (61%) and discipline measures (59%) as the most common stimuli for aggression.” Reisner IR, Shofer FS, Nance ML; “Behavioral assessment of child-directed canine aggression.” Department of Clinical Studies, School of Veterinary Medicine, University of Pennsylvania, Philadelphia, PA 19104-6010, USA.

- Food Guarding
- Resource Guarding
- Possessive Aggression

These are all terms describing the use of aggressive behaviors to maintain possession of valued items. The aggression can be directed towards humans or other animals.

Items can include anything which motivates an individual animal. In companion dogs these can be:
- Food
- Bones
- Rawhide
- Stolen Items

**Possessive aggression**
The sphere of guarding (critical distance in which a dog may react to approaching individuals) can increase over time to the point of the animal guarding a space that the valued object is contained within.

The behavior can be seen concurrently with Conflict Aggression and Territorial Aggression.

Punishment or forced removal of items or food can increase the likelihood of the animal escalating aggressive displays to maintain control of items. This fear based response can result in the aggressive guarding of benign items that may not contain the same value as the original objects possessed by the dog.

The aggressive behaviors can be directed to both familiar and unfamiliar individuals when the appropriate circumstances exist to motivate the guarding response.

Fear based body postures may be present initially but over time, as the dog learns the value of using aggression, body language may appear more confident.

**Other possible diagnoses**
- Disease Conditions - Is there a medical condition causing the dog to use aggression to prevent pain inducing activities
- Conflict Related Aggression - Does the aggression extend to other situations where the dog is using aggression to have an individual cease certain activities
- Dominance Related Aggression - Does the dog displace another individual from a valued resource?

**Medical examination**
Always begin with having the animal evaluated medically and appropriate testing should be performed. Conditions which cause pain or conditions which increase appetite may result in an increase in food acquisition and guarding behaviors.

**Treatment**
- Avoid known triggers (secure food, control access to toys and highly valued items, isolate during feeding and feed small meals)
- Consistent periods of play and exercise
- Avoid confrontation over retrieval of objects
- “Nothing in Life is Free” routine in order to increase consistency of interactions and put control of resources in owner’s hands
- Provide alternate items and activities, especially at high risk times, to substitute for the animal focusing on other valued items
- Trade for valued items that must be retrieved
- Utilize a leash and head collar to facilitate redirecting the dog’s behavior when needed

Once the level of tension has reduced between the dog and owner, if desired, the owner can work on teaching:
- “Drop It” and “Leave It” commands for managing object possession
- Desensitization to the presence of the owner around the food bowl in order to manage food guarding behaviors

Possessive Aggression is typically managed and controlled and not cured. As with most forms of aggression, the only guarantee can be made with a recommendation of euthanasia. Short of this option, the owner is always accepting some degree of risk.
Symptoms of anxiety, distress or panic exhibited when animals are left alone. Separation anxiety can be characterized by pacing, drooling, vocalization, destruction, and elimination which are not related to other behavioral disorders. All or some of these behaviors can be present.

**Behavioral symptoms**
- **Monotonal Vocalization/Barking** - Typified by barking and whining which begins soon before or after departure and persists for a large percentage of the time the dog is alone. Often is reported to the owners by neighbors.
- **Inappropriate Elimination** - Depositing of urine and/or stool in various locations around the home (as opposed to in a single, consistent location). Only occurs when the dog is alone or perceives that they are alone. Stool may be abnormal in appearance (is commonly mucoid).
- **Destructive Behavior** - Characterized by damage to exit points from the home (doors and windows) or destruction of personal items (pillows, clothing, remote control units). Confinement in a cage often escalates the destruction and can result in injury to the animal (tooth or toenail fracture for example)
- **Hypersalivation** - Is often considered to be highly suggestive of separation anxiety when the behavior is restricted to those times when the dog is alone or perceives to be alone.

**Data collection**
- Physical Examination
- CBC
- Chemistry Profile
- Thyroid Profile
- Urinalysis
- Fecal Exam

**Behavioral history - who, what, when, where**
Who is present at the time of the behavior (is the pet alone or are there people present), before the behavior begins (departure) and afterwards (arrival).
- Who is the primary caretaker of the animal and how does the pet interact with this person (follows the person or is willing to be voluntarily separated from that person)
- Describe the behavior. What does the pet do when alone? Videotaping the dog’s activity when alone can help to verify whether the pet appears anxious (panting, pacing, etc)
- When does the behavior occur? Is the pet alone or does it perceive to be alone (while owner is sleeping or in the shower, for example). Or does the pet have full access to the owner when the behavior occurs.
- Where does the behavior occur? Are the behaviors directed toward exit points or are there multiple locations vs. single locations in the home.

**Previous history**
- Age of onset and character of the behavior at onset
- Changes in the pet’s environment at onset such as a move, work schedule change, or loss of a house member
- Treatments attempted previously and outcome

**Medical differential diagnosis**

**Hypersalivation**
- Dental Disease
- Oral Foreign Body
- Oral Toxin
- GI Distress
- Medical Differential Diagnosis

**Vocalization - any condition resulting in pain**
- Otitis
• Osteoarthritis
• Dental Disease
• Severe Dermatitis
• Etc

**Inappropriate elimination**
• Lower Urinary Tract Disease
• Diabetes Mellitus
• Cushing’s Disease
• Renal Failure
• Colitis
• Inflammatory Bowel Disease

**Behavior differential diagnosis**

**Hypersalivation**
• Only known behavioral cause of hypersalivation is anxiety, most commonly separation anxiety

**Vocalization**
• Territorial Behavior
• Attention Seeking Behavior
• Hyperactivity
• Play Behavior
• Behavior Differential Diagnosis

**Destructive behavior**
• Normal Puppy Behavior
• Exploratory Behavior
• Food Acquisition Behavior

**Inappropriate elimination**
• Failure to Housetrain or Loss of Housetraining
• Marking Behavior

**Co-morbidity**
• High probability of dogs with noise phobia or thunderstorm phobia to also have separation anxiety
• If any of these conditions are present in a pet, carefully evaluate the animal for the other conditions

**Treatment**
The overall goals of treating separation anxiety are to reduce dependence on the owners…..

**Attention seeking behavior**
Owners should not respond in ANY way to the pet’s attempts to get attention from them by such behaviors as barking, whining, jumping up, pawing, etc. They should not look at, talk to or touch their dog at these times. Expect the behavior to initially get worse and more physical.

**Departure and arrival routine**
Have the owners ignore the dog for 30 minutes prior to leaving home. This is meant to prevent inadvertent reinforcement of anxious behavior as they prepare to leave.

Ignore dog upon arrival until it is relaxed

**Arrival routine**
The owners should not interact with their dog when they arrive home until the pet is completely calm.

**Distraction at departure**
Use a Kong Toy stuffed with a treat, or some similar product, at the time of departure. This is meant to distract the dog away from the act of the owners departing from the home. The toy should be given approximately 5-10 minutes before departure.

**Use of punishment**
The owners should not use physical or verbal punishment in response to destructive behavior or elimination. These behaviors are symptoms of anxiety and punishment, especially after the fact, will increase the level of anxiety.

**Uncoupling departure cues (habituation)**
This refers to making a list of activities the owners perform prior to leaving home which signals to the pet that they are leaving and results in the dog getting more and more anxious. These activities are then performed at times when there is no intention of leaving the home.
Indoor relaxation exercises
Have the owners train the dog to assume a calm, relaxed behavior during gradually increasing periods of separation. This is commonly done when moving casually from room to room.

Graduated departure exercises
Have the owners train the dog to assume calm, relaxed behavior during gradually increasing periods of separation as they leave the home. They may need a “bridge” cue to signal “safe” departures.

Exercise
Consistent exercise in the form of walks and play can serve to reduce anxiety by decreasing the dog’s focus on the owner’s departure from the home.

Anti-anxiety medication
The judicious use of medication can decrease the overall level of anxiety and enable the pet to respond better to the behavioral tasks just outlined

Clomipramine
- A Tricyclic Antidepressant (TCA) that functions primarily to elevate the levels of serotonin and norepinephrine in the synaptic cleft of brain neuropathways
- 1-4 mg/kg bid
- Allow at least 2-4 weeks for onset of action
- Expect sedation and anorexia as common side effects. Increased anxiety, aggression and hepatic disturbances are less common
- Preliminary CBC/Chemistry Profile and Thyroid Panel pre-treatment
- CBC/Chemistry Profile 4 weeks post-treatment
- Allow 2-3 months on the medication with the behavior being relatively normal
- Begin weaning by decreasing the dose by 25% every 3-4 weeks until off the medication or when symptoms return. Then return to the previously effective dose.

Fluoxetine
- Fluoxetine is a Selective Serotonin Reuptake Inhibitor (SSRI). Only has an effect on Serotonin and not on other neurotransmitters
- 1-2 mg/kg SID
- Allow at least 6-8 weeks for onset of action
- Expect sedation and anorexia as common side effects. Increased anxiety, aggression and hepatic disturbances are less common
- Preliminary CBC/Chemistry Profile and Thyroid Panel pre-treatment
- CBC/Chemistry Profile 4 weeks post-treatment
- Allow 2-3 months on the medication with the behavior being relatively normal
- Begin weaning by decreasing the dose by 25% every 4-6 weeks until off the medication or when symptoms return. Then return to the previously effective dose.

Benzodiazepines
- These are typically used in Separation Anxiety to treat panic behavior seen at time of departure to help ease the transition
  - Diazepam (Valium)
  - Alprazolam (Xanax)
  - Clorazepate (Tranxene)
All have short onset, short half-lives and are used in conjunction with TCA’s and SSRI’s

Trazodone
- It is a serotonin agonist at 5HT1A receptor and a weak serotonin reuptake inhibitor.
It is unclear which of these effects is responsible for the reduction in anxiety that occurs with its use.
- 1-3 mg/kg dose either as needed or up to 3 times per day
- Begin at the low end of the dose range for 3 days then increase dose gradually as needed
- Can be used along with an SSRI or TCA but use carefully to minimize possible side effects
  - drowsiness, nausea/vomiting, headache and dry mouth, dizziness, constipation, urinary retention
- Hypotension, tachycardia, syncope, arrhythmias

Factors effecting outcome
- The older the patient at the time of onset or presentation, the poorer the prognosis
- Multiple diagnoses will decrease the prognosis
• The ability of the owners to follow through on recommendations
• The ability to administer medication and the patient’s response to that medication
• The living situation of the owners (neighbor complaints or degree of damage to the home)
Sibling Rivalry:  
When Roommates Come to Blows  
John Ciribassi, DVM, DACVB  
Chicagoland Veterinary Behavior Consultants

Risk factors

Household instability  
- One or more dogs in household achieving social maturity (1-3 years)  
- New pet or person added to home  
- Illness in one or more pets in the home  
- Pet returning from an absence  
- History of one or more dogs in the home of having poor early socialization with dogs (genetics, early health issues, inadequate exposure)  
- Anxiety related condition(s) in one or more dogs in the home (Separation Anxiety, Noise Phobia, CCD, General Anxiety, Fear Based Aggression, Conflict Aggression)  
- Medical condition causing irritability (Otitis, Dermatitis, etc.)  
- Deprived environment (fewer than ideal resource load; food, resting areas, owner interaction)  
- Same-sex pairs in the home.  
- Most commonly females. Particularly in spayed females  
- Young dogs being added to a household or dogs rehomed to a household are more likely to initiate fights

Typical history  
- Often between two specific dogs even in a multiple dog household (>2 dogs in the home)  
- Various stimuli  
- Excitement in the home (greetings, passing through narrow openings, territorial barking, laughter or arguing in the home or running through the home)  
- Resources (food, owner attention, toys, space) – recognize the relative value of the items to each individual dog in the household (Resource Guarding Potential)  
- Hierarchy conflicts – behaviorally appropriate dogs are similarly motivated to maintain or acquire access to similar resources.  
- Competition can be over one specific person in the home  
- Owners undermine appropriate social structure between the dogs  
- Aggressor may persist in attacks even if victim offers proper deferent signaling

Differential diagnosis  
- Medical conditions  
- Dominance Hierarchy – Resource Related  
- Anxiety Related  
- Redirected aggression  
- Play Related Aggression

Differential diagnosis  
Commonly seen with newly introduced housemates  
- Fear Based Aggression  
- Territorial Aggression

Typically increased social contact between housemates diminishes the likelihood of these interactions. However, socially inept dogs may show a reduced inability to adapt to prolonged exposure and continue to display behaviors more common with contact between unfamiliar dogs.

Medical conditions  
Any condition which causes increased pain or irritability can increase the likelihood of an aggressive response between dogs  
- Otitis Externa  
- Osteoarthritis  
- Dermatitis
Dominance hierarchy – Resource related
If there is equal motivation between dogs in a household over the acquisition or holding of a resource we can see an escalation of aggression between those individuals. Commonly a factor between intact males in the same household.

Equal opportunity and established possession testing
Anxiety related
- Behaviorally inappropriate dogs
- Do not adequately recognize normal signaling in other dogs (deference cues such as lip licking, yawning, turning away, moving away or exposure of underbelly, for example)
- Excessively reactive. More likely to target another dog in the home in situations characterized by high arousal (exposure to excitement stimuli)
- Can have poorly inhibited bites

It is critical to recognize, in these instances of aggression between dogs in the same household in which the attacker is socially inappropriate, the victim’s quality of life may suffer greatly. These dogs are doing everything they know how to diffuse the aggression and communicate deference or submission to the attacker but the attacks persist.

Stress escalates when the individual has minimal control over the outcome of a situation. This chronic stress results in continued activation of the Hypothalamic Pituitary Axis and thus prolonged cortisol exposure for the victim.

Redirected aggression
- The victim of the attack is the secondary target. The attacker cannot access the primary focus (another dog passing the home, for example, and then targets the other dog in the home which is more available.
- Can result in extreme fear in the victim, who can respond in a likewise aggressive manner thus escalating or maintaining the aggressive relationship between the dogs

Play based aggression
- Typically occurs between younger dogs
- Bites are usually inhibited so that significant injury does not occur
- Frequent reversal of roles during fights such that each dog will take turns showing dominant displays (mounting or biting over the dorsal aspect of the neck, for example)
- If excessive, can escalate to more extreme encounters necessitating the owners to intervene

Fear based aggression
- Fearful animals may elect to utilize aggressive responses in order to manage or cope with stressful situations involving new dogs in a household
- May be initiated by the newcomer or the resident dog
- Depending on the age and experience of the fearful animal you may or may not see typical fearful signs (tail tucked, cowering, ears down and back, etc.) Dogs with a longer history of fear based aggression may have abandoned these postural strategies due to perceived ineffectiveness and now depend on aggression as a better coping response.

Territorial aggression
- Resident dog responds to newcomer by preventing access to valuable space.
- May be the home itself, certain areas of the home, the yard or valued sleeping areas.

Prognosis
- The likelihood of a successful outcome is good if both dogs are behaviorally appropriate, if resources can be identified, and the resources can be adequately managed.
- Prognosis is poor if one or both dogs are behaviorally inappropriate (anxiety or fear is a component of the behavior), particularly if response to medication is inadequate
- Prognosis is also poor if aggression occurs immediately whenever dogs come into sight of one another….

Diagnostic evaluation
- Physical Exam
- Neurologic Exam
- CBC, Chemistry Profile and Thyroid Screen
- Further labs as indicated by basic work up
Questions

- Household composition
- When aggression began
- Frequency
- How are resources managed between the dogs
- How do dogs interact outside of aggressive episodes
- How do fights occur. Give examples from most recent to previous fights as well as description of earliest fights.
- How do the fights resolve
- Are there injuries

The most important question is which dog, if any, is acting appropriately in the interactions. In this way, the attention can be centered on the correct dog. That may be changing the response of the dog acting inappropriately in the relationship or, if both dogs are appropriate, managing the resources in the household.

Treatment

- Manage resources (food, toys and attention) – “dogs are not best thought of as a pack in a home environment. They are best thought of as roommates who need to learn to share”
- Identify all situations which trigger aggression and avoid these triggers or separate the dogs at these times
- Safety
- Provide owners with means to break up fights (head collars with drag leashes, blankets, air horns, water, instruct in removing dog by pulling on rear legs)
- Isolate pets when unsupervised
- Address triggers (food, toys, resting areas, access to owners)
- Feed dogs separately
- Do not leave toys out but apportion them as needed
- Deny access to elevated surfaces and have dogs resting remotely away from owners (on mats or dog beds, for example)
- Basket Muzzles

These can be used whenever there is a higher likelihood of aggression between the dogs where the owners are not as likely to be able to quickly intervene. Can result in increased comfort for the owner in knowing the dogs are at least safe from severe injury.

- Separation with gates or tethers
- Used when dogs cannot be closely supervised
- NILIF or "SIT" protocol
- Goal here is to increase the dog’s attention to the owner for direction
- Regular periods of basic training (clicker training)

By increasing the dog’s level of responsiveness it allows the owner better ability to direct their dog’s behavior and therefore having them show less focus on each other. A good recall is important in that it gives the owner the ability to call the dogs away in potentially problematic situations.

- Have owners ignore BOTH dogs if owner attention is causing hierarchy issues between the dogs

The goal here is to reduce the value of the owner as a resource for either dog. Increased owner attention to either dog (as opposed to trying to figure out which dog is higher ranking with respect to this particular resource) can escalate the owner’s value and thus increase conflict and also elevate emotionality in the home (problematic for the behaviorally inappropriate dog).

- Support higher ranking dog?

There are several problems with this approach

- Difficulty for owners to identify accurately
- Owners may be reluctant to demote an older, favored dog
- Dogs who are behaviorally inappropriate may not be signaling correctly and thus owners red these dogs incorrectly thus favoring a dog who is showing aggression at the wrong times and putting the victim in a difficult situation
- The aggression in the household may not involve hierarchy at all

Response substitution (operant counter conditioning)

- This involves interrupting the dog and then redirecting to more appropriate sets of behaviors (that the owners have been rehearsing with the dog on a regular basis in non-distracting situations) and reinforcing those behaviors.
- Does not reinforce the aggression since the dog is being relocated and not reinforced until it complies with a request to perform an alternate behavior. We are conditioning a behavior that is counter to the problem behavior.
Counter conditioning and desensitization to graded triggers such as sounds in the environment
If there are triggers which can be identified as causes of the aggression, and the intensity of these triggers can be adjusted, the owners can gradually expose the dog(s) to the trigger at slowly increasing levels (desensitization) while asking the dog to perform more appropriate competing behaviors (counter conditioning).

**Example: Door bell triggering excessive greetings and resulting aggression.**

**Reintroduction**
In some cases dogs have to be separated for an extended time while owners work on getting consistent responses from each dog separately and each dog learns it will receive positive rewards for attending to the owner. This would be needed if the dog’s cannot be in each other’s company without immediately reacting.

Once each dog is responding well separately from each other, then they can be reintroduced on walks. First at a comfortable distance while going through training individually then gradually decreasing the distance between them as they adjust.

**Treatment**
If treatment proves to be unsuccessful, other options include:
- Rehoming
- Permanent Separation of the dogs
- Euthanasia (particularly if one of the dogs is behaviorally inappropriate)

**Should dogs “fight it out”?**
In one study, 42% of dog fights did not require intervention to break them up.

However, if there is a history of injury to either of the dogs involved in fighting, it would be inappropriate to allow them to continue to fight without intervening. The injuries demonstrate that the dogs have been unable to arrive at a mutually beneficial agreement over partitioning or resources. If the fights are motivated by fear or anxiety in behaviorally inappropriate dogs, they will be incapable of regulating the level of violence and injuries are likely.

In these cases, owners need to learn how to safely break up fights

**Options in breaking up dog fights**
- Wheelbarrow the attacker by picking up the rear legs and lifting while moving back and to the side
- Compressed air or citronella
- Water
- Sudden noises such as with pot lids
- Board to wedge between the dogs
- Blankets or cushions
- Leashes attached to both dogs (with or without a head halter)

**Drug therapy**
- ONLY if one or both dogs are abnormal in terms of fear/anxiety
- SSRI (05-2.0 mg/kg SID)
- Fluoxetine
- Sertraline
- Paroxetine
- Selegiline if Canine Cognitive Dysfunction (1 mg/kg SID)
- As Needed Options
- Clonidine (0.01-0.05 mg/kg 1-2 hours before needed or up to tid)
- Trazodone (3-5 mg/kg 1 hour before needed up to tid)
- Benzodiazepines (not indicated in fear based aggression due to the possibility of disinhibition).

**Pre-treatment blood work**
CBC/Chemistry profile/Thyroid profile

**Post-treatment blood work (4-8 weeks post onset of therapy)**
CBC/Chemistry profile
- Pheromones (Adaptil)
- Neutraceuticals such as Anxitane

**Surgery (if hierarchy related)**
- Castration
- OHE? No indication that OHE is successful at reducing aggression between females in the same household.

**Client education**
• Discuss canine body posturing and communication methods
• Regular communication with client to enable adjustment of treatment plan

Prevention
• Add dogs to home of different genders and ages
• Regulate access to resources
• Castration to help prevent intermale aggression
• Proper socialization
• Puppies stay with litter until about 8 weeks of age
• Socialization classes between 8-14 weeks of age and reward based obedience class at around 4-6 months of age
Aggression is one of the most common complaints presented to veterinary behaviorists. According to the Centers for Disease Control, approximately 4.5 million people are bitten by dogs each year in the United States. One study has indicated that approximately 41% of dogs had growled, snarled or snapped at a familiar person at some time in the dog’s life.

Classification and labeling of aggression is in a continuous state of flux as behaviorists continue to understand the underlying motivation and emotional states involved in aggressive encounters. Because canine communication occurs along a continuum, which includes aggressive displays and responses, understanding and treating aggression in dogs can be misunderstood and mismanaged. Although the labels for the aggressive response may differ within the behavioral community, the treatment often results in improvement and safe management.

In order to create an appropriate treatment program for a patient, it is important to identify the type of aggression through identification of whom the aggression is directed toward and what the underlying motivation and/or situation is. It is best to first identify whether the aggression is human-directed or animal-directed. Then determining an accurate diagnosis will depend on the circumstance, the body language of the patient and the motivation. Motivations for an aggressive response may include play, fear, pain, protective, territorial, resource-related, predatory, lack of impulse control, conflict-related and/or redirected response.

Diagnosis should always include a thorough medical evaluation as well as a behavioral evaluation. A behavioral evaluation is enhanced with direct observation of the behavior, but this is not always feasible due to safety considerations. Utilizing an aggression screen and the behavioral information from the history (vocalization, posture, context, and target of the aggression) will lead to a diagnosis. It is also important to remember that pets are complex creatures and often will have multiple diagnoses.

Counseling owners on aggression requires a solid knowledge base of both normal and abnormal behavior, basic learning principles and a thorough understanding of psychotropic medications. Liability concerns should be addressed when working with clients with an aggressive patient, including but not limited to utilizing informed consent forms.

The goals of counseling an owner with an aggressive animal are to obtain an accurate history, identify the motivation for the behavior, determine a prognosis for the likelihood of future aggressive events and educate the owner on safe management of the patient. Prognosis may be based on six factors: 1. The ability/willingness of the owner to modify the situation; 2. The ability/willingness of the owner to modify their own behavior; 3. The size/strength of the patient; 4. The severity of bites/aggressive events; 5. The underlying motivation of the patient and 6. The predictability of the aggression.

Basic tools for treatment of canine aggression identification of motivation and triggers, behavior modification techniques, environmental modification techniques (including modifications for safety), meticulous record keeping (including teaching owners to journal), +/- surgery, +/- medication and thorough follow-up.

The above principles will be discussed and demonstrated through case discussions.

References available upon request.
Changing Behavior Pharmacologically: Which Drug Do I Use?
Beth Strickler, DVM, DACVB
Veterinary Behavior Solutions
Johnson City, TN

In an era where people have demanding schedules and desire quick fixes, many clients come to their veterinarian for a pill to “cure” their pet’s behavior problem. For many patients, use of a medication as part of the behavioral treatment plan is essential. As more behavioral drugs become available to the veterinarian, it can be difficult to discern which medication is appropriate for usage in a particular patient. This seminar will give a very brief introduction to behavioral pharmacotherapy. In order to have a thorough understanding of psychopharmacology, it is best to pursue in-depth continuing education.

Appropriate use of behavioral medications requires: 1. an appropriate diagnosis and 2. an understanding of the medication’s effects, onset to efficacy, side effects and interactions with other medications. The goals of using psychotropic medications are multifold: 1. to decrease emotional reactivity when the stimulus cannot be controlled; 2. to potentiate behavioral therapy (decrease time to improvement); 3. as synergism with behavioral therapy (to obtain an increased level of improvement); and/or 4. to treat a pathology responsible for behavior that requires pharmacological intervention. Studies have shown that using behavioral medications can lead to a quicker outcome and a higher level of improvement.

Many drugs used in veterinary behavior have limited controlled studies. Veterinarians are often required to make decisions on application of behavioral drugs without the benefit of scientific evaluation for a particular indication or a label for the condition. Many drugs have been transferred from usage in the human psychiatric community but may have different side effects and toxicities than humans, some of which are not yet known. Some behavioral drugs also have potential for human abuse. State laws also vary regarding requirements for usage of controlled drugs.

It is important to remember that the brain and all synapses are in a dynamic state. The actual response that occurs is a result of an infinite number of factors in the individual brain. Therefore, the response of a behavioral drug may not necessarily be the expected effect of the drug. The existing chemical and physiologic state of the neuron and synapse as well as the resting tone of the neurotransmitter system will influence the ultimate response to the drug.

Because few psychotherapeutic drugs are labeled for use in veterinary medicine, most behavioral drugs are extra-label use. Requirements for extra-label use from the Animal Medicinal Drug Use Clarification Act 1994 (AMDUCA) include:

• Establishment of a valid client-veterinarian-patient relationship
• Behavioral history must be taken
• Veterinarian must establish diagnosis
• Veterinarian must keep up with literature
• Owner must be informed of extra-label use
• Owner should sign informed consent
• Record must be kept of drug, condition treated, species of animal treated, dosage and duration

The selection of a drug requires accurate diagnosis of the behavior problem and knowledge of the existing data regarding use of that behavioral drug for a particular diagnosis. It is recommended that selection of the drug include consideration of whether a drug is labeled for that condition. First choice should be a drug labeled for that condition in that species (i.e. clomipramine or fluoxetine for separation anxiety in dogs). If there is no behavioral drug labeled for that condition in that species (i.e. no behavioral drugs are labeled for usage in cats, birds, etc.), then the second choice should be a drug labeled for that condition in another species. Third choice should involve a drug labeled for the condition in humans. Selection of a particular drug should also include assessment of the animal’s health (consider contraindications for health status or concurrent medications), the cost of medication, owner compliance, (dosing frequency, mode of administration, bitterness of drug), expected time to efficacy, side effect profile and your experience with that particular drug.

A medical assessment is recommended (in addition to the behavioral history) prior to prescribing a behavioral drug. Since many of the behavioral drugs cannot be stopped “cold turkey” without significant side effects, it is important to know the metabolic status of the individual prior to starting the medication. The minimum database recommended prior to starting a medication is a complete blood count, chemistry profile, +/- thyroid profile, and +/- urinalysis.

It is imperative that follow-up be conducted regarding efficacy of the medication and health of the patient. Many clients do not understand that it can take weeks for the medications to have effect. Additionally, the dosage may need to be adjusted in order to achieve full efficacy or reduce side effects. A typical recheck schedule may involve:

• 1-2 weeks (by phone, e-mail or in-office): Discuss side effects, if any. If fast-acting medication, evaluate efficacy. If some benefit, may increase dosage. Review behavior modification recommendations.
• 4-6 week (in office): Evaluate efficacy of slow onset medication. Change dosage if necessary. Review behavior modification recommendations.
• 10-12 week (in-office): Assess efficacy of full behavior treatment plan.
• 6-9 months (in-office): Evaluate possibility of weaning off medication (if feasible).

Some patients may be difficult to medicate either secondary to aggressive behavior or because of fearful or unruly behaviors. Compounding behavioral drugs into palatable treats is often recommended to increase compliance. Transdermal formulations of behavioral drugs have not been shown to be effective in behavioral treatment. Blood levels of behavioral drugs administered transdermally can be significantly lower than expected or produce unpredictable levels due to application. Slow-release forms that have been formulated for humans can also vary according to species and may give unpredictable blood levels as well.

When selecting a behavioral drug for usage with a behavioral disorder, the first decision must be whether an immediate-acting drug (such as a benzodiazepine) is indicated and/or a maintenance drug (such as a TCA or SSRI) will be beneficial. Behavioral drugs affect neurotransmitters at presynaptic sites, postsynaptic sites or within the synapse itself. Tri-cyclic Antidepressants (TCAs) are inhibitors of neurotransmitters serotonin and norepinephrine. They also have antihistaminic effects, anticholinergic effects and are α-1 adrenergic antagonists. The effects of TCAs vary by drug, with clomipramine being the most serotonergic of the TCAs typically used in veterinary medicine. Most of the TCAs have a very bitter taste and can be difficult to medicate. All TCAs have a slow onset of action (2-4 week latency to behavioral effect). The TCAs can be given once or twice daily. TCAs are metabolized in the liver and clearance occurs through the kidneys. TCAs need to be stopped with gradual withdrawal.

Indications for usage of TCAs can include anxiety, fears and phobias, compulsive disorders, affective aggression (TCAs that have a serotonergic effect), urine marking, and depression. Side effects of TCAs vary between drugs, but can include sedation, constipation, diarrhea, tachycardia, cardiac arrhythmias, blood pressure changes, interference with memory, anxiety, restlessness/agitation, sleep disorders, fatigue, headache, ataxia, urinary retention and/or lowered seizure threshold. TCAs should not be used in combination with MAOIs or sympathomimetics. Examples of TCAs commonly used in veterinary behavior include clomipramine, doxepin, amitryptiline and imipramine.

SSRIs (Selective Serotonin Reuptake Inhibitors) inhibit serotonin reuptake at the presynaptic site allowing serotonin molecules to act for longer periods of time. SSRIs can also have a slow onset of action (1-4 week latency to effect). SSRIs are metabolized through the liver and excreted through the kidneys. Most SSRIs have a long half-life.

Indications for usage of SSRIs are anxiety disorders, compulsive disorders, fears and phobias, urine marking and/or aggression. Side effects of SSRIs are fewer than TCAs and can include: sedation, gastrointestinal (such as anorexia, nausea and diarrhea), anxiety, agitation, insomnia, aggression, tremors, mania and seizures (rare). SSRIs should not be used with MAOIs or cimetidine. When combining an SSRI with another behavioral drug, caution should be used. SSRIs can be used cautiously at lower doses in combination with TCAs, buspirone and tryptophan, but combinations of serotonergic drugs can result in serotonin syndrome. SSRIs are also competitive inhibitors of several cytochrome P450 enzymes and may result in elevated levels of SSRIs or another medication if those pathways are used concurrently. SSRIs may also alter the metabolism of benzodiazepines. SSRIs commonly used in veterinary behavior include: fluoxetine, paroxetine, sertraline, fluvoxamine and citalopram.

Trazodone (a Serotonin 2A Antagonist and Reuptake Inhibitor - SARI) has been a more recent addition to veterinary medicine. Trazodone has been used to treat anxiety and depression in humans and as well as an aid in sleep. Indications for usage include post-surgery confinement, hospitalization, anxiety as a solo agent and in combination with other psychotropic medications.

Many patients benefit from a combination of medications. Combining medications requires a thorough understanding of the individual medication, the potential for increased side effects and changes in metabolism and the risk for serotonin syndrome.

Serotonin syndrome is a potential complication of serotonergic drugs. It is a rare, life-threatening complication that can occur when central 5-hydroxytryptophan (5-HT) receptors are overactivated. Serotonin syndrome can be a result of inappropriately combining medications or overdosing a particular serotonergic drug. The result is mental and neuromuscular changes or death (mortality rate in humans is 11%). Symptoms of serotonin syndrome may include tachycardia, tachypnea, agitation, anorexia, hyperpyrexia, hypertension, diarrhea and/or seizures. The only treatment for serotonin syndrome is symptomatic treatment.

References available upon request.
How Do Animals Learn: What’s All the Psychobabble?
Beth Strickler, DVM, DACVB
Veterinary Behavior Solutions
Johnson City, TN

Many veterinary staff avoid discussing behavioral issues with clients because they are unfamiliar with the terminology of learning theory. A basic understanding of learning theory is imperative for working effectively with animals with and without behavioral issues. Every interaction that occurs with an animal results in learning. It is important that veterinary professionals understand the science behind how animals learn (both deliberately and “accidentally”) and that we understand how to teach them new information.

Learning is a process whereby an organism is changed. It can be seen as an external behavior or may be a change in an internal process. In animals, we typically monitor learning by behavior. The process of learning depends on the animal’s perception, the animal’s memory and the animal’s ability to categorize events as similar or dissimilar to previous events. The animal’s behavioral response (or evidence of learning) depends on the animal’s physical ability to perform the response, the animal’s motivation, the animal’s opportunity for response and whether learning truly occurred.

Learning terminology and techniques

Classical conditioning
Classical conditioning is the pairing of a neutral stimulus (that has no pre-existing meaning for the animal) with another stimulus, which results in a learned (conditioned) response. These can be either positive or negative results. The most recognized example of classical conditioning is the salivary reflex in Pavlov’s dogs. Pavlov’s dogs began to associate the arrival of food with various unconditioned stimuli (such as bells ringing) and began to salivate with the ringing of the bell.

Operant conditioning
Operant conditioning involves learning that a consequence (positive or negative) occurs with an action. In this situation, the animal causes the results - what the animal does is critical to what happens next. The likelihood of a behavior increases if it is reinforced or decreases if it is punished (see above).

It is important to remember that dogs and cats are learning all the time - intentionally or unintentionally. In the real world of dog behavior, classical and operant learning can occur simultaneously. For example, even though your dog associates the sound of the can opener with food and begins to salivate at the sound of it (classical conditioning), he is then rewarded for coming to the food bowl with the food (operant conditioning).

Reinforcement
A reinforcer is a “reward”. Reward implies that it is good and that both the giver and the receiver consider it a reward. If this is true, reinforcing a behavior will increase the likelihood of its occurrence.

Positive reinforcement (+R)
- This involves adding something the animal likes to increase the likelihood that the behavior will recur.
- Example: You say “sit”, your dog sits and you give him a treat. The treat serves to increase the likelihood of the response in the future.

Negative Reinforcement (-R)
- This involves the removal of something unpleasant when a behavior is performed which increases the likelihood that the behavior will recur.
- Example: You ask your dog to “sit” while pushing on his rump, your dog sits, and you stop pushing on his rump. This will also increase the likelihood of the behavior occurring in the future.

Punishment
Punishment will result in a behavior occurrence decreasing with the presentation or removal of something undesirable. Unfortunately, punishment is often not accurately or effectively used by humans and can cause an increase in anxiety, fear and aggression.

Positive punishment (+P)
- This involves the presentation of something undesirable (negative) when a behavior is performed. Because the consequence is negative, the behavior will decrease. +P must occur within seconds of the behavior to be effective. +P is rarely used in treatment of behavior disorders in animals because: 1. Humans are very poor at timing +P; 2. Anxiety or fear may be associated with the individual delivering the +P; 3. +P does not provide an alternative behavior for the animal; and 4. +P may increase aggressive behavior.
- Example: Dog jumps on you, you knee him in the chest. (Note: this is not recommended because many dogs who are punished learn to fear the punisher or shut down in training – see above).

Negative punishment (-P)
- This involves the removal of something good as a consequence for the behavior, which causes the behavior to decrease.
- **Example:** Puppy is playing too roughly, owner stands up, leaves the area and stops play; puppy’s rough playing therefore decreases.

**Desensitization (DS)**
Systematic desensitization involves gradually exposing an animal to a stimulus at a low level so that it does not evoke an undesirable response. The goal is to work on replacing an undesirable response with a more appropriate response (such as a relaxed, calm response rather than an anxious, fearful or excitable response). Note that this is a systematic exposure, starting at a low level and slowly increasing the level of exposure over many learning sessions.

**Flooding**
Flooding is used in some situations to treat low level fears by exposing the individual continuously to the stimuli that causes them anxiety until the fear is extinguished. This is not typically used with animals because it may worsen the condition rather than improving it in some circumstances.

**Counterconditioning (CC)**
Counterconditioning is often used in conjunction with desensitization (DS/CC). This involves teaching the animal a response that is incompatible with the response previously given in a situation. For example, you may teach a dog to stop barking at the door using DS/CC by using a low-level doorbell stimulus (the sound muted until the dog does not respond) while teaching him to sit in a calm manner when the sound occurs. Systematically, over many sessions, the intensity of the doorbell stimulus is increased.

**Generalization**
Generalization occurs when animals begin to transfer the information they have learned in a particular setting to other settings. This often requires training in multiple setting with varying degrees of distraction before generalization begins to occur.

**Extinction**
Extinction occurs when a reinforcer is withheld from an animal. Over time this will lead to the elimination of the behavior. It should be noted that many animals will exhibit an “extinction burst” following removal of the reinforcer, in which case the behavior will intensify as the animal tries harder to get the reward before the behavior extinguishes.

References available upon request.
Incorporating treatment of behavior problems into a busy veterinary practice is often avoided due to a lack of time or knowledge. Behavioral treatment can be done efficiently with preparation, a strategic plan and appropriate usage of the full veterinary team.

The initial approach to a behavioral issue with a client/patient should be equivalent to the triage of a medical crisis. The client will typically contact either the receptionist or the technician with the problem or may casually mention the problem during a routine visit. When receiving this information, the staff member should initially determine whether the client is in crisis; all staff members should be trained to recognize the signs of a behavioral crisis. Although many behavior problems develop over time and gradually worsen, some behavior issues may be critically urgent when the client brings them to the attention of the clinician.

Typical signs of a behavioral crisis may include injury to people (such as a bite), injury to other animals (such as a fight between dogs in the home) or injury to the patient (such as a severe storm phobic who has jumped through a window). An additional sign of a crisis is a client who is discussing possible relinquishment or euthanasia. Critical situations should be scheduled for an immediate appointment with the veterinarian to determine the appropriate approach to the problem. It may be warranted to board the patient at the hospital for 24 or more hours in order to allow the client relief from the risk of physical harm and/or allow the client relief from mental or emotional stress.

Once the situation has been triaged, the veterinarian can begin to differentiate whether a primary medical diagnosis has resulted in the problem behavior or a primary behavioral diagnosis is responsible for the crisis. This may involve a series of diagnostics to rule out medical issues prior to addressing the behavioral problem. A minimum data base for many behavior problems includes a thorough and rigorous physical examination, including an evaluation for neurological function and sources of pain, as well as a full metabolic screen. Once the medical factors have been ruled out, it can be determined whether the patient needs an in-clinic behavioral evaluation, needs to be referred to a qualified professional trainer or technician or needs to be referred to a qualified behaviorist (a DACVB or CAAB). This may be determined through information gathered in an interview with the client or may be more efficiently gathered in a written history form completed by the client.

If a behavior evaluation is scheduled with the clinician at your hospital, the consultation should be scheduled to allow adequate time for evaluation of the problem. The charges should also be consistent with the time necessary to diagnose the behavioral condition and create a treatment plan. A diagnosis is achieved through meticulous history taking and observation of the pet and its interaction with the owner(s). It is common to have multiple behavioral diagnoses when working with a behavior patient; patients rarely present with a single behavioral complaint.

Once the problem(s) have been diagnosed, they may then be addressed with a repertoire of tools used in treatment of behavioral diseases in animals. Typically, a combination of behavioral modification, environmental modification and +/- pharmacological intervention is used in the animal’s treatment program. Veterinarians in private practice often shy away from behavioral medicine because of time restraints. A qualified veterinary technician can be an integral part of the process in history taking, demonstrating behavior modification techniques and usage of behavioral tools as well as implementation of the treatment plan and follow-up.

In order to be an effective behavior team member, the veterinary behavior technician must have appropriate knowledge of learning theory, training techniques and tools, and commonly prescribed behavioral medications. The successful veterinary behavior technician must also be an empathetic listener, as many behavioral issues can be emotionally exhausting for clients. The veterinary behavior technician must also be able to communicate well with the veterinarian to ensure that the treatment plan is consistent with the veterinarian’s recommendations.

Many veterinary staff avoid discussing behavioral issues with clients because they are unfamiliar with the terminology of learning theory. A basic understanding of learning theory is imperative for working effectively with animals with and without behavioral issues. Every interaction that occurs with an animal results in learning. It is important that veterinary professionals understand the science behind how animals learn (both deliberately and “accidentally”) and that they understand how to teach them new information. This will enable veterinary professionals the ability to create plans to change undesirable behaviors to preferred behaviors and to understand why behavioral treatment plans work/do not work.

Owner compliance with a behavior treatment plan is improved when the client is given written instructions, receives follow-up from the clinician/technician and understands an appropriate time line for improvement. A treatment plan is a fluid and changing model that should be adjusted as the patient begins to respond to treatment. Some behavioral issues may improve slowly while others are quickly and easily managed. It may be important to help the client realize that treatment of behavior problems are often seen as being “managed” rather than “cured”. Access to a support system through the veterinary staff enables clients to more easily handle the chronic nature of managing a behavioral patient.

References available upon request.
Jumping and Mouthing and Digging, Oh My!
Managing Unruly Behaviors

Beth Strickler, DVM, DACVB
Veterinary Behavior Solutions
Johnson City, TN

A significant number of dogs which are surrendered to a shelter each year are relinquished due to behaviors that can be classified as “unruly” (such as jumping up, mouthing, vocalizations, destructive behaviors and nocturnal activity). Unruly behaviors can be frustrating both to the owners and to the veterinarians who attempt to efficiently help clients with these issues. Medical issues should always be eliminated as possible causes of unruly behaviors before diagnosis of a behavioral problem. Understanding how to manage these behaviors will benefit both veterinarians and clients.

The initial behavioral approach to many unruly behaviors should include an evaluation of the current daily budget for the pet. This includes an evaluation of the provided opportunities for exercise and cognitive enrichment. Additionally, an evaluation of the structure and predictability of the daily schedule for the pet may help illuminate areas where undesirable behaviors may be inadvertently rewarded. Often the approach to unruly behaviors is focused on the inappropriate behavior or treating the behavior as a “dominance issue” when a better approach may be to satisfy the pet’s needs physically and psychologically while focusing on a desired behavior as a replacement behavior.

Jumping-up in canines is a normal behavior that can occur during play or greeting. In a large breed dog, it can be a serious issue and result in injuries to owners and visitors. There are many techniques that pet owners have often tried prior to seeking help; some of these techniques may have accidentally rewarded the jumping behavior. Appropriate management may involve use of a head halter, withdrawal of attention (both verbal and physical) and/or response substitution.

Mouthing in canines can occur during play, during greeting and possibly during manipulation of the dog (such as during grooming or while fastening on a leash). Management of mouthing behaviors may involve desensitization and counterconditioning to handling and manipulation, withdrawal of attention and redirection to an alternative oral behavior.

Excessive barking in canines can be a crisis for some owners. Barking can be motivated by many different factors such as territorial issues, excitement, attention-seeking, food-soliciting, conflict, fear, play, group-facilitation, separation anxiety, cognitive decline and/or reinforcement. Management of barking involves identifying the trigger and/or motivation and removing the trigger, if possible. Response substitution and extinction techniques may be used, as well as training tools such as citronella anti-bark collars.

Destructive chewing may be a normal behavior for many puppies and adolescent dogs. It may also be a result of exploration, play, scavenging, hunger or attempts to escape. Separation anxiety or noise phobias should be ruled out as potential differentials. Management may involve ensuring the dog has adequate opportunities for chewing, adequate exercise, “dog proofing” the home and/or confining the dog. Medical causes may also be a contributing factor in some dogs, often geriatric.

Nocturnal activity in cats is often a behavioral problem in young, energetic cats, but may also be an issue in geriatric cats with cognitive dysfunction. Management of young cats involves active play during the day with moving objects, preventing access to sleeping areas during the day and possibly providing a playmate.

Excessive vocalization may be a problem in many oriental breeds of cats, but may also be a result of attention-seeking behavior, hunger, territorial arousal and/or cognitive dysfunction. Management may involve identifying the owner’s response and removing reinforcement of the behavior in many situations. Additionally, rewarding appropriate quiet behavior is often beneficial.

Scratching is a normal feline behavior which can be destructive to the home environment. It is typically a social message (both visual and chemical) which is displayed by five weeks of age. Management involves providing a scratching area that is desirable to the cat. The scratching area should preferably be at least 30 cm off the ground, be taller than the cat when he/she stands on the hind legs, should be located next to the sleeping area and/or an area which has previously appealed to the cat. A texture that the cat finds attractive (such as sisal or jute) should be used. A kitten or cat can be trained to the area.

References available upon request.
An essential component of behavior consultations includes gathering information from the client, engaging the client in the treatment plan, and ensuring that the client is making progress toward a goal throughout the patient’s treatment. Many clients are apprehensive when entering into behavioral treatment for their pet as the unknown can be discomforting. Training of veterinarians often concentrates on the interaction with and the comfort of the pet while ignoring the human-human interactions. The creation and implementation of a treatment plan for a behavioral patient is only effective if the plan is followed through. The human component of the treatment plan is essential and is dependent upon the client’s willingness for compliance. Clients arrive at a behavioral consultation with a goal in mind. Sometimes the goal is vague, such as “I would love my dog to behave better” or “I want my dog to stop destroying my house”. Often the goal is additionally steeped in emotion. Individuals often select a goal based on the perceived outcome rather than the actions that are necessary to achieve the goal. The task of the veterinarian is to define and refine the goal so that it is achievable.

Motivation can be defined as the desire to perform voluntary actions to achieve a desired outcome. Motivation is dependent on both the difficulty of the task and the perceived reward and has been shown to be highest with a combination of identified goals and feedback. When a client is considering how to spend their time and energy, the outcome of that decision is affected by the concept of a goal. A goal may be an experience, an end-state, or an outcome. Goal setting requires identification of both delayed (Distal Goals) and immediate (Proximal Goals or Subgoals). Subgoals provide an immediate source of information regarding progress toward the distal or ultimate goal. Completion of subgoals provides information regarding whether the ultimate goal is appropriate, may supply feedback that provides motivation, and/or may influence the individual’s sense of self.

Research in the field of human motivation has identified a number of reasons why individuals are able to achieve goals. Highly competent people tend to set difficult but attainable goals, create subgoals as steps to their ultimate goal, structure their environment for success, self-evaluate to determine where they are in the process of achieving the goal and learn how to create positive outcomes. Goals are most effective when they are specific, as this allows the individual to identify whether the goal is being achieved and allows for appropriate feedback to occur. Goal-specificity results in increased planning and increased effort from the individual. Precision of how and when the subgoals will be achieved increases the probability of success. For example, outlining a subgoal as “train your pet for 10 minutes once daily in the evening after dinner” allows a client to identify whether or not they are achieving success as opposed to “work on training when you can.”

Highly competent people also identify task strategies that help them achieve a goal. This may include “if-then” plans (known as implementation intentions). In the example of an aggressive pet in the home, creating an if-then plan with the owner will allow them to have a safety management plan in place for situations in which aggression may occur. Evidence indicates that up to 95% of goal-directed behavior can become and often is unconscious or automatic; therefore, establishing the automatic response through structured techniques will help create appropriate automatic behaviors. Simulations are effective in helping individuals prepare an automatic response in a situation in which the behavior needs to be quick and effortless. Airplane pilots utilize simulations to become proficient at handling emergencies and automatize their response. Simulations may be beneficial with behavior clients and patients and can be implemented with models.

Emotions can interfere with both setting goals and achieving goals. When working with a family during a behavior consultation and implementation of a treatment plan, different emotions experienced by each family member contribute to the success or failure of the plan. For example, in a home where there has been a bite to a family member, the victim may be experiencing fear while at the same time is still highly bonded to the pet. Another family member may be angry at the pet and want immediate removal of the pet from the home. This allows the goal to be “framed” (i.e. changes the perspective from which the goal is viewed). Identifying the emotional influence on goal achievement involves accurate reading of nonverbal information (such as body language and eye contact) and engagement of all family members in the consultation.

Goal shielding is a technique that prevents other goals or behaviors from interfering with the desired goal. This may occur through creation of operant thoughts (such as cognitive maps, scripts and plans). Operant thoughts are mental attempts to try out different strategies to problem solve. A cognitive map is a visual or graphical representation of the individual’s belief system. Creation of a cognitive map may be assisted through use of interview techniques. Open-ended questions and closed-ended questions will move individuals in varying directions while creating their cognitive map. The technique of motivational interviewing provides guidance on interactions with clients to empower the client while making them an active participant in the goal-setting and achieving process. Empowerment can occur through creation of scripts (creation of memories of behavioral sequences necessary to complete an activity) and plans for goal achievement.
Individuals who do not achieve goals may be thwarted from achievement by a fear of failure or ridicule or regret that the individual may feel if he/she does not achieve the goal. The client’s motivation in this situation is to protect their self-esteem rather than achieve the goal. Empathic listening by the veterinarian will allow the client to express and address their fears and concerns. Often clients feel they have a lack of guidance or feedback to help them achieve a goal. For some clients, the change in their behavior (or their pet’s behavior) does not appear important or necessary and/or they are frozen in ambivalence (if the list of pros for change equals the list of cons). A lack of ability is rarely the cause of individuals not achieving goals.

Studies have shown that individuals who are told “do your best” do no better achieving a goal than if they had no goal at all. Whether we are working with a client managing a disease (such as treatment of a diabetic patient) or working with a behavior patient, helping clients create a functional plan is essential to the success of veterinary treatment.

References available upon request.
Adapt, Improvise, and Overcome: Interesting Large Animal Ruminant Cases
Misty Edmonson, DVM, MS, DACT
Auburn University
Auburn, AL

This presentation will review some unique and challenging cases. These cases include the following: a case of albendazole toxicity in alpacas, spastic paresis in a pygmy goat, a few cases of severe preputial stricture in bulls, and other cases of reproductive failure in bulls.

Albendazole toxicity in alpacas
Three crias presented for fevers of 24 to 48 hours duration. The crias were a 2 month old female, a 6 months old male, and a 7 month old male. The fevers were ~105-107°F. The owner administered flunixin meglumine and oxytetracycline prior to presentation and had a history of lethargy and diarrhea. Physical examinations of the three crias revealed that the crias were depressed with harsh lungs sounds; all crias were febrile and had diarrhea. Diagnostics performed included complete blood counts (CBC), chemistry profile, fibrinogen, fecal examinations, BVDV testing, and +/- fecal cultures. The female cria was positive for tapeworms while the 2 male crias were negative for parasites. All crias were negative for BVDV via PCR from buffy coat, and fecal cultures were negative, as well. Complete blood counts revealed severe leukopenia, specifically neutropenia, in all crias with WBC counts of 4200, 2030, and 180; serial CBCs showed a regenerative response. Treatments for the crias consisted of florfenicol antibiotic (n=3), praziquantel anthelmintic (n=1), IV fluids (n=1), flunixin meglumine (n=2), and Filgrastim (n=1). Filgrastim is a human granulocyte colony-stimulating factor (G-CSF) that acts on hematopoietic cells to stimulate proliferation and differentiation. In the one cria that received Filgrastim, the WBC count increased from 2030 to 6910 following 2 days of treatment (one vial = $240). One animal died soon after presentation, and the remaining 2 animals were discharged with no explanation for the severe neutropenia. After speaking to the owner (for the fourth time), he “remembered” giving albendazole and numerous other anthelmintics to his young crias; albendazole was given >5 times the label dose for at least 5 days in most cases. Albendazole toxicity causes bone marrow hypoplasia with 9 previous cases reported in alpacas (Gruntman, 2006). Three to four months following administration of the toxic doses of albendazole, the affected alpacas began to “blow their fiber” with large foci of alopecia.

Spastic paresis in a pygmy goat
Spastic paresis is rare, but has been reported in 3 pygmy goats between the ages of 1-2 years (Baker et al, 1989) and in Czechoslovakian in a Saanen goat in 1973. Clinical diagnosis is based on physical examination. Successful treatmend of spastic paresis in these goats included tibial neurectomy (n=4) and desafferentation of the dorsal spinal roots (n=1). The goat that presented underwent bilateral, tibial neurectomy. Tibial neurectomy was performed by dissecting between both parts of the biceps femoris m. and identifying the tibial nerve. Successful identification of the tibial nerve is confirmed with electrostimulation of the nerve and appropriate muscle stimulation. Once the nerve has been accurately identified, the nerve is transected. Within 24 hours of surgery, the goat began walking normally and one leg and much improved on the second leg. The owner reported a normal gait in the goat 3 months post-operatively.

Severe preputial stricture in bulls: an interesting repair
A 10 year old Brahman bull presented for a history of preputial injury which had been treated conservatively by the rDVM. The owner and rDVM became concerned about the bull when he noticed that the bull was having difficulty urinating. On presenation, the bulls had a preputial swelling approximately 6 inches proximal to the preputial orifice. A stricture was palpated inside the preputial orifice, and necrotic tissue was removed which allowed the bull to urinate. Owner wanted to do everything possible to save the bull so a resection and anastomosis of the prepuce was performed. Seven days post-operatively, another stricture was detected at the surgical site. Four weeks later, and second resection and anastomosis of the prepuce was performed, and four days later, the prepuce began to stricture down yet again. So, a plastic tube was inserted into the preputial cavity to help prevent further stricture formation. The plastic tube was maintained within the preputial cavity for fifty-five. Once the tube was removed from the preputial cavity, the prepuce continued to stricture. Therefore five days later, surgery was performed to create a preputial stoma. A two inch stoma was created between the ventral prepuce and skin of the sheath to create a marsupialization from the prepuce to the skin. A penrose drain was sutured to the penis and exited through the stoma. The bull was discharged with 60 days of sexual rest. Following this time, the owner exposed the bull to a cow and saw the bull breed the cow. The cow was only exposed to this bull, and the rDVM confirmed that the cow was pregnant; the Brahman bull mentioned above with a calf on ground by natural service, and a Santa Gertrudis bull that has had semen collected through his stoma.
Fetal mummification in a Brahman cow

A 5 year old Brahman cow that was primarily used as an embryo donor presented for a possible fetal mummification. A 7 day embryo was transferred on May 24th. She was confirmed pregnant approximately 4 weeks later on June 20th with an estimated calving date of March 3rd. Upon passing her due date, the cow was palpated by the rDVM and diagnosed with a possible mummified fetus (~7 month fetus). Upon presentation, the physical examination was normal except for the presence of a presumed fetal mummy of approximately 6-7 months of age. The fetus was difficult to reach via transrectal palpation. Due to the potential value of the fetus, additional diagnostic tests were performed to confirm the diagnosis of fetal mummification. These additional tests included the following: transabdominal ultrasonography, testing for pregnancy specific protein B with the BioPRYN® blood test, and fetal electrocardiogram. The fetal echocardiogram was performed by directing the leads across the cow (negative lead at mid-level jugular groove, positive lead at inguinal region between stifle and abdomen). This technique would allow for detection of both the dam and the fetus’ heart rate and rhythm at the same time. Based on ECG, ultrasound, and eventually a BioPRYN® test, the cow was confirmed to be pregnant with a fetal mummy. Based on the size of the fetal mummy, luteolytic drugs and colpotomy were ruled out as possible treatment options. Because of the value of the cow, the owners elected for surgical removal of the fetal mummy with the cow under general anesthesia.

References available upon request.
The use of antimicrobials has been a conventional therapy in treatment of uterine infections in cattle. However, the use of antibiotics has not been without controversy. Debate continues regarding antimicrobial efficacy, effects on future fertility, risk for bacterial resistance and residues. The proper use of antimicrobials to treat uterine infections must first begin with an appropriate diagnosis and thorough understanding of the immunology of the uterus, the pathophysiology of uterine infections, and the properties of the various antimicrobial agents that may be used therapeutically.

### Intrauterine therapy

A variety of antibiotics and antiseptics have been infused into the uterus of cows to treat postpartum infections. Intrauterine antimicrobials are used in order to achieve high concentrations at the site of infection but are usually unable to penetrate any deeper than the endometrium. The intrauterine use of antimicrobial agents is controversial as some have found intrauterine treatment to be beneficial while others have found these agents to have no effect or a detrimental effect. The bovine uterus is an anaerobic environment. Thus, antibiotics that are chosen for intrauterine infusion must be active in the absence of oxygen. Additionally, most antibiotics depress the activity of uterine neutrophils and interfere with uterine defense mechanisms. Thus, one must carefully evaluate the evidence regarding intrauterine antimicrobial use and carefully consider both the advantages and disadvantages associated with therapy.

Historically, intrauterine use of antimicrobials has been a common therapy for treatment of uterine infections. Antimicrobials that have been reportedly used for these infections include tetracycline, penicillin, cephapirin, chloramphenicol, Lugol’s iodine, gentamycin, spectinomycin, sulfonamides, nitrofuransone, povidone iodine solution, urea, and chlorhexidine. Although, most of these compounds are not approved for intrauterine use and have no published withdrawal times. There are also reports that intrauterine infusion of antibiotics causing drug residues in milk. In addition, regulatory guidelines must be adhered to in cases of extralabel use of antimicrobials in food animals. Intrauterine therapy is considered an extralabel use, and thus may be prohibited for many antibiotics, particularly in the United States.

The organisms that cause most postpartum infections are usually sensitive to penicillin. However, bacterial contaminants present within the uterus during the first several weeks postpartum produce penicillinase which makes penicillin useless if used locally in the early (less than 30 days) postpartum period. By 30 days postpartum, the contaminant bacteria are usually eliminated and intrauterine treatment with penicillin is more likely to be effective. Other factors may also affect the efficacy of intrauterine antibiotic therapy. Uterine lochia present during uterine infections contains organic fluids and debris that can render certain antibiotics, such as sulfonamides, ineffective.

More recently, oxytetracycline has been the antimicrobial that is commonly used for intrauterine therapy. However, one study indicated that most isolates of *A. pyogenes* are resistant to oxytetracycline. This study also showed that large doses of intrauterine oxytetracycline did not affect the frequency of isolation of *A. pyogenes*. In addition, oxytetracycline as well as Lugol’s iodine are quite irritating and are reported to cause coagulation necrosis of the endometrium. Although some studies indicate an improvement in reproductive performance with the use of intrauterine oxytetracycline, it has been speculated that this improvement may be due to local prostaglandin production due to chemical irritation of the endometrium.

In general, intrauterine infusion of antimicrobials has generally failed to show any increase in reproductive performance. Although, two large field studies evaluated the use of cephapirin benzoate in cows with clinical endometritis and reported some improvement in reproductive performance. However, other studies indicate no improvement in reproductive performance when evaluating intrauterine administration of cephapirin benzoate. The appropriate use of intrauterine antibiotics to treat uterine infections still remains controversial as only a limited number of studies indicate the efficacious use of intrauterine antibiotics.

### Intrauterine antiseptics

Numerous antiseptics have been used to flush and lavage the postpartum bovine uterus with iodine and chlorhexidine solutions being most commonly used. Many of these solutions are quite irritating to the endometrium and are thought to stimulate endogenous prostaglandin release. One study showed that the incidence of retained fetal membranes and endometritis was reduced in cows that received 500 mL of 2% Lugol’s iodine immediately after calving and again 6 hours later. However, this study did not evaluate the future reproductive performance of these treated cows. Another study evaluated the use of 50 to 100 mL of 2% povidone iodine solution in the uterus one month postpartum and found that the reproductive performance of normal cows was not improved and that the treatment was detrimental to the fertility of cows with endometritis.
Systemic antibiotic therapy

Cattle with metritis often suffer from moderate to severe illness. These cattle are often septic and present with fever, depression, and anorexia. A variety of antibiotics have been recommended for parenteral use in cattle suffering from uterine infections. Penicillin or one of the synthetic penicillin analogues and ceftiofur are two of the most common antibiotics used systemically in cattle suffering from metritis. Systemic use of oxytetracycline may not be efficacious because of the difficulty in achieving the minimal inhibitory concentration (MIC) required for *A. pyogenes* in the uterine lumen. However, one study reported clinical improvement of cattle suffering from metritis with the use of tetracycline at 10mg/kg.

Ceftiofur is a third generation cephalosporin that has broad-spectrum activity against gram negative and gram positive bacteria. Ceftiofur (when administered parenterally) is reported to reach all layers of the uterus without causing violative residues in milk. Ceftiofur is approved in the United States for systemic administration to lactating cows affected with metritis. A subcutaneous dose of ceftiofur at 1mg/kg in post-partum cows results in a concentration of ceftiofur and its active metabolites in plasma, uterine tissues, and lochia at a higher MIC than required for most of the common pathogens involved in metritis. One study demonstrated that ceftiofur administered at 2.2mg/kg daily for 5 days was effective in treating cows with metritis. Another study supported these findings and showed ceftiofur administered at 2.2 mg/kg once daily for 5 days is as effective for treating metritis as procaine penicillin G or procaine penicillin G with intrauterine infusion of oxytetracycline.

Because of the reported lack of efficacy and potential detrimental effects of future fertility, intrauterine infusion of antibiotics is not a favored treatment for most cases of metritis. Certain systemic antibiotics have demonstrated their effectiveness at treating uterine infections in cattle. Thus, most cases of metritis, especially cows that are toxic, should be treated with systemic antibiotics such as penicillin or ceftiofur.

Conclusion

There are no antibiotics currently approved for intrauterine administration. Intrauterine infusion of antibiotics leads to contamination in milk and tissues for which appropriate withdrawal times have not been ascertained. In addition, the assays used on farm to detect antibiotics in milk may not be accurate. Although some studies indicate a positive response to therapy with the use of intrauterine antimicrobials, most studies do not show an improvement in reproductive performance or clinical signs of disease when comparing intrauterine antimicrobial therapy and systemic antibiotic therapy. This information, in conjunction with concerns regarding uterine or endometrial damage and withdrawal times following the use intrauterine antimicrobials, suggests systemic antibiotic therapy as the best treatment for many cases of cows with uterine infections.

References available upon request.