Outline

- When to prescribe
- Monitoring
- Medication choices
- Outcome considerations
- Case examples

Medications for Shelter/ Rescue Dogs

- Address immediate welfare concern
  - Improve adoptability
  - Smoother transition to new home
  - Shorter term treatment
- Address behavior disorder
  - Improve welfare short and long term
  - Make less adoptable pet more adoptable
  - Able to maintain pet in a home long term

Guidelines for Use

- Goals of medication use
  - Address specific underlying neurotransmitter alterations
  - Decrease reactivity
  - Make behavioral and environmental modification easier to implement
  - Medications do not change pet’s behavior itself
    - Modify underlying emotional state contributing to problem

Overall 2004
Luasscher 2009

When to Prescribe

- Things to consider
  - Risk assessment
  - Shelter’s resources
  - Shelter’s community

- Risk Assessment
  - Safety- animals and people
    - Physical and emotional risk
  - Quality of life assessment
    - Be improved to life worth living or enjoyed?
    - Pet and person
    - Re-evaluated at regular intervals
  - Risk of continued behavioral deterioration
    - What is the risk of waiting?
    - Problem worsen to become dangerous or the welfare so severely compromised cannot recover?
    - Unacceptable to keep pet in current situation where improvement cannot be made and deterioration is inevitable
Risk Assessment

<table>
<thead>
<tr>
<th>Dog Size</th>
<th>Dog Strength</th>
<th>Number of Bites</th>
<th>Severity of Bites</th>
<th>Location of Bites</th>
<th>Triggers</th>
<th>Motivation</th>
<th>Targets</th>
<th>Warning Signs</th>
</tr>
</thead>
<tbody>
<tr>
<td>small</td>
<td>weak, fine boned, missing teeth</td>
<td>1 bite, back away</td>
<td>no mark, minor bruising</td>
<td>upper arm, thigh</td>
<td>1 predictable, able to avoid</td>
<td>play</td>
<td>1 predictable, able to avoid</td>
<td>try to leave, conflict body language, growl, lunge +/- snap</td>
</tr>
<tr>
<td>medium</td>
<td>light frame</td>
<td>1 bite, back away</td>
<td>minor abrasion, moderate bruising</td>
<td>body part closest to pet, no jumping up</td>
<td>2 predictable, able to avoid</td>
<td>fear, territorial</td>
<td>2 predictable, able to avoid</td>
<td>growl, lunge, +/- snap, inhibited bite</td>
</tr>
<tr>
<td>large</td>
<td>moderate to heavy musculature</td>
<td>bite and hold, bite repeatedly, multiple bites in one incident</td>
<td>puncture, laceration</td>
<td>upper arm, thigh, abdomen, face; pet jumped up to bite</td>
<td>1 unpredictable, not able to avoid all</td>
<td>severe fear, territorial, +/- predatory</td>
<td>redirected, 1 unpredictable, not able to avoid all</td>
<td>no warning signs or given as lunge to bite</td>
</tr>
<tr>
<td>giant</td>
<td>heavy musculature, especially around head and neck</td>
<td>bite, hold, shake, kill</td>
<td>flesh/appendage removal, fracture, internal injury, death</td>
<td>upper arm, thigh, abdomen, face; pet jumped up to bite</td>
<td>more than 1 unpredictable, unavoidable</td>
<td>conflict</td>
<td>redirected, more than 1 unpredictable, unavoidable</td>
<td>no warning signs or given as lunge to bite</td>
</tr>
</tbody>
</table>

When to Prescribe

- Shelter’s Resources
  - Can your organization manage this behavior problem?
    - Manpower
    - Time
    - Education
    - Money

- Requirements to Prescribe
  - VCPR/VSPR
  - Medical evaluation
  - Diagnosis or working diagnosis
  - Always consider other treatments that can be implemented
  - Labwork?
  - Follow up plan
  - Outcome plan

Outcome Options/ Other Treatments

- “Plan for the worst, hope for the best.”
  - Best to have back up plan
  - Recommend ideal plan first, if declined, give 2nd option
  - Remember potential consequences for no option B for shelter pet
  - Is it fair for the options to be adopt or die?

Outline

- When to prescribe
- Monitoring
- Medication choices
- Outcome considerations
- Case examples
Monitoring

- Designated person(s)
- Follow up plan
- Post-outcome plan
- Adoption vs.
- Transfer

Outline

- When to prescribe
- Monitoring
  - Medication choices
    - Brief review of neurotransmitters
  - Outcome considerations
  - Case examples

Neurotransmitters

- Chemical messengers
  - Glutamate
  - γ (gamma) aminobutyric acid (GABA)
  - Acetylcholine (Ach)
- Monoamines
  - Dopamine (DA)
  - Norepinephrine (NE)
  - Serotonin (5-HT)

Glutamate

- Amino acid
- Major excitatory neurotransmitter in brain
- Est. 60-75% of brain uses glutamate
  (Crowell-Davis, Murray 2006)
- Abnormal levels in impulsive, aggressive, and schizophrenic disorders in people (Overall 2001)
GABA
- GABA-γ (gamma) aminobutyric acid
- Synthesized from glutamate
- Major inhibitory neurotransmitter in CNS
- Role in vigilance, anxiety, muscle tension, seizure activity, and memory (Crowell-Davis, Murray 2006)

Acetylcholine (Ach)
- Synthesized from choline and acetyl coenzyme A (acetyl CoA)
- Only neurotransmitter not directly synthesized from an amino acid
- Postganglionic parasympathetic synapses (muscarinic), autonomic ganglia/brain/adrenal medulla (Nicotinic n), and neuromuscular junctions (Nicotinic m)
- Involve learning, memory, alertness
- Reward and dependence systems activated

Neurotransmitters
- Monoamines (biogenic amines)
  - Catecholamines:
    - Dopamine
    - Norepinephrine (noradrenaline)
    - Epinephrine (adrenaline)
  - Indolamines
    - Serotonin
    - Melatonin
    - Histamine

Catecholamines
- Tyrosine → Dopa → Dopamine → Norepinephrine
- DA and NE cell specific
- DA-phenothiazines, MAOIs, natural rewards
  - Substantia nigra
- NE- alpha and beta adrenergic
  - Agonist/antagonist activity at pre- or post-synaptic receptors
  - Locus coeruleus

Serotonin
- Tryptophan → 5-hydroxytryptophan (5-HTP) → 5-hydroxytryptamine (5-HT, serotonin) → melatonin
- Midbrain raphe
- 14+ receptor types
  - Involved in medication side effects

Serotonin
<table>
<thead>
<tr>
<th>RECEPTOR</th>
<th>FUNCTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>5-HT 1A</td>
<td>Prereceptor; autoreceptor- inhibits firing of neuron, synthesis, and release of 5-HT; postreceptor</td>
</tr>
<tr>
<td>5-HT 1B</td>
<td>Autoreceptor- inhibits additional 5HT release</td>
</tr>
<tr>
<td>5-HT 2A</td>
<td>Platelet aggregation and smooth muscle contraction</td>
</tr>
<tr>
<td>5-HT 2B</td>
<td>Found on human heart valves</td>
</tr>
<tr>
<td>5-HT 2C</td>
<td>Regulates appetite</td>
</tr>
<tr>
<td>5-HT 3</td>
<td>In GIT, CRTZ (vomiting, nausea)</td>
</tr>
<tr>
<td>5-HT 4</td>
<td>GIT (secretion and peristalsis)</td>
</tr>
<tr>
<td>5-HT 6</td>
<td>Limbic system</td>
</tr>
<tr>
<td>5-HT 7</td>
<td>Limbic system</td>
</tr>
</tbody>
</table>
Medication Choices

What is your goal?
- Kennel stress, immediate welfare control
  - Short onset medication
    - Benzodiazepines
    - Trazodone
    - Clonidine
    - Gabapentin

Medication Choices

What is your goal?
- Anticipate long term management of behavior disorder
  - Separation anxiety
  - Generalized anxiety
  - Significant frequent fears
  - Compulsive disorders
- Pet with anticipated long term stay
  - Longer term chronic daily dosing might be appropriate
    - SSRIs
    - TCAs
    - Azapirones

Medication Choices

Administration requirements
- Frequency
  - Does the organization have the manpower to medicate multiple times per day?
  - Lower frequency, better compliance
- Route
  - Most are oral
  - Mix in food, pill pockets, peanut butter, etc.
- Difficulty administering
  - Aggressive, fearfull animals
    - Level of stress of administration worth the benefit of medication?
      - Cats

Medication Choices

Cost, availability
- Money and time most often limiting factors
  - Not for profit
  - Rely on donations, grants

Abuse potential
- If you are not there to monitor, manage, who is?
- Staff, volunteer diversion risk

Legal constraints
- Rabies observation
  - Behavioral side effects mimic neurologic changes?
- Court ordered holds
  - Requirement to hold "evidence" in manner to prevent deterioration
    - Physical health but also mental health
  - Long term holds
    - Welfare concerns
- Discuss concerns with officers involved

Back to the Medications…

Fast acting Short term medications
### Medication Choices - Dogs

<table>
<thead>
<tr>
<th>Drug Class</th>
<th>Drug Name</th>
<th>Dose</th>
<th>Side Effects</th>
<th>Schedule</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benzodiazepine (GABA)</td>
<td>Clonazepam (Klonopin ®)</td>
<td>0.1-1 mg/kg</td>
<td>Sedation, hypotension at high doses</td>
<td>PO PRN or q 8-12 hrs</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Benzodiazepine (GABA)</td>
<td>Alprazolam (Xanax ®)</td>
<td>0.01-0.1 mg/kg</td>
<td>Paradoxical excitation</td>
<td>PO PRN or q 8-12 hrs</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Serotonin Antagonist and Reuptake Inhibitor (SARI)</td>
<td>Trazodone (Desyrel ®)</td>
<td>2-10 mg/kg Maximum 300 mg per dose*</td>
<td>Sedation, GIT side effects especially with initial doses</td>
<td>PO PRN or q 8-12 hrs</td>
</tr>
</tbody>
</table>

**Fast acting - immediate stress and anxiety control**

**Medication Choices - Dogs**

- **Medications**
  - Benzodiazepines
    - Diazepam (Valium®)
      - Case reports of fatal idiosyncratic hepatic necrosis after oral dosing
      - Clinical signs occur 5-11 days after beginning oral therapy
      - Anorexia, lethargy, vomiting, increased ALT/AST, hyperbilirubinemia
  - Seizures
  - Aminopyrine
    - Bronchitis, vomiting
  - Levetiracetam
    - Convulsive status
  - Gabapentin (Neurontin ®)
    - 50-100 mg CAT to facilitate handling
    - Sedation, ataxia; Human liquid contains xylitol
  - Gabapentin (Neurontin ®)
    - 0.025 – 0.08 mg/kg OR ¼ to ½ of 0.5 mg tablet (0.125-0.25 mg/ CAT)
    - Sedation, ataxia; hypotension at high doses
  - Gabapentin (Neurontin ®)
    - 0.01-0.1 mg/kg OR 0.125-0.25 mg/ CAT
    - Paradoxical excitation, behavioral disinhibition

**Medication Choices - Cats**

<table>
<thead>
<tr>
<th>Drug Class</th>
<th>Drug Name</th>
<th>Dose</th>
<th>Side Effects</th>
<th>Schedule</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anticonvulsant/ Neuropathic analgesic</td>
<td>Gabapentin (Neurontin ®)</td>
<td>5-20 mg/kg OR 50-100 mg/ CAT to facilitate handling</td>
<td>Sedation, ataxia; Human liquid contains xylitol</td>
<td>PO PRN or q 8-12 hrs (open capsule, mix with food) (Min 2+ hrs prior to effect)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Serotonin Antagonist and Reuptake Inhibitor (SARI)</td>
<td>Trazodone (Desyrel ®)</td>
<td>12.5-100 mg/ CAT</td>
<td>Sedation, GIT side effects especially with initial doses</td>
<td>PO PRN or q 12 hrs (Min 2+ hrs prior to effect)</td>
</tr>
</tbody>
</table>

**Fast acting - immediate stress and anxiety control**

**Medication Choices - Cats**

- **Medications**
  - Benzodiazepines
    - Diazepam (Valium®)
      - Case reports of fatal idiosyncratic hepatic necrosis after oral dosing
      - Clinical signs occur 5-11 days after beginning oral therapy
      - Anorexia, lethargy, vomiting, increased ALT/AST, hyperbilirubinemia
    - Recc. baseline liver values prior to starting and repeated ~ 5 days after chronic dosing

**Medication Choices - Dogs**

- **Medications**
  - Phenothiazine
    - Acepromazine
      - Tranquilizer
      - Little to no anxiolytic effect
      - Can increase sensitivity to noise
    - Inappropriate to use alone to manage noise aversions or in any environment where noise might be a problem

**Medication Choices - Dogs**

- **Medications**
  - Phenothiazine
    - Acepromazine
      - Tranquilizer, not an anti-anxiety agent

**Medication Choices - Cats**

- **Medications**
  - Phenothiazine
    - Acepromazine
      - Tranquilizer, not an anti-anxiety agent

**Medication Choices - Dogs**

- **Medications**
  - Phenothiazine
    - Acepromazine
      - Tranquilizer, not an anti-anxiety agent

**Medication Choices - Cats**

- **Medications**
  - Phenothiazine
    - Acepromazine
      - Tranquilizer, not an anti-anxiety agent
Longer Term Chronic Medications

- **Antidepressants**

Serotonin Syndrome

- Concentration of serotonin too high, reach toxic levels
  - Nausea, confusion, agitation, muscle rigidity, tremors, salivation, hyperthermia
  - May lead to seizures, coma and death
- Occur when combine MAOI and another antidepressant (usually TCA or SSRI) concurrently
  - Inhibition of NT degradation coupled with reuptake inhibition

Serotonin Syndrome

- Occur with other combinations as well
  - Multiple MAOIs
    - Amitraz- Mitaban, Preventic collars, Promeris, Certifect
  - Diets high in tryptophan (5-HT precursor)
  - OTC herbal supplements
    - St. John’s Wort (act as MAOI or broad spectrum reuptake inhibitor) (Schwartz 2005)
  - Griffonia seed extract (5-HTP)
  - Other serotoninergic medications
    - Trazodone, tramadol- lower risk

Medication Choices- Dogs

Longer Term Chronic Anxiety Control

<table>
<thead>
<tr>
<th>Drug Class</th>
<th>Drug Name</th>
<th>Dose</th>
<th>Side Effects</th>
<th>Schedule</th>
</tr>
</thead>
<tbody>
<tr>
<td>Selective Serotonin Reuptake Inhibitor (SSRI)</td>
<td>Fluoxetine (Prozac®)</td>
<td>1-2 mg/kg</td>
<td>Sleepiness or irritability, inappetence</td>
<td>PO q 24 hrs</td>
</tr>
<tr>
<td>Selective Serotonin Reuptake Inhibitor (SSRI)</td>
<td>Sertraline (Zoloft®)</td>
<td>1-4 mg/kg</td>
<td>Mild GIT side effects</td>
<td>PO q 24 hrs or divided q 12 hrs</td>
</tr>
</tbody>
</table>

Medication Choices- Dogs

Longer Term Chronic Anxiety Control

<table>
<thead>
<tr>
<th>Drug Class</th>
<th>Drug Name</th>
<th>Dose</th>
<th>Side Effects</th>
<th>Schedule</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tricyclic Antidepressant (NE, 5-HT, α1, others)</td>
<td>Clomipramine (Clomicalm, Anafranil®)</td>
<td>2-4 mg/kg q 24h or 1-3 mg/kg q12h</td>
<td>Vomiting (give with food), sleepiness, anticholinergic effects</td>
<td>PO q 12 or 24 hrs (see dose)</td>
</tr>
<tr>
<td>Azapirone Anxiolytic (5-HT 1A)</td>
<td>Buspirone (BuSpar®)</td>
<td>0.5-2 mg/kg</td>
<td>Side effects uncommon</td>
<td>PO q 8-12 hrs</td>
</tr>
</tbody>
</table>

Antidepressants- TCA’s

- **Table 11.1**

  Acute *in vitro* biochemical activity of selected tricyclic antidepressants

<table>
<thead>
<tr>
<th>TCA</th>
<th>NE</th>
<th>5-HT</th>
<th>α1</th>
<th>α2</th>
<th>H1</th>
<th>Muscarinic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amtriptyline</td>
<td>+/-</td>
<td>++</td>
<td>+++</td>
<td>+/-</td>
<td>++++</td>
<td>++++</td>
</tr>
<tr>
<td>Clomipramine</td>
<td>+</td>
<td>+++</td>
<td>++</td>
<td>0</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Desmipramine</td>
<td>+++</td>
<td>0</td>
<td>-</td>
<td>0</td>
<td>0</td>
<td>+</td>
</tr>
<tr>
<td>Doxepin</td>
<td>++</td>
<td>+</td>
<td>++</td>
<td>0</td>
<td>+++</td>
<td>+</td>
</tr>
<tr>
<td>Imipramine</td>
<td>+</td>
<td>+</td>
<td>++</td>
<td>0</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Nortriptyline</td>
<td>+</td>
<td>+/-</td>
<td>+</td>
<td>0</td>
<td>+</td>
<td>+</td>
</tr>
</tbody>
</table>

  Source: Potter 1984; Potter et al. 1991; Richelson and Nelson 1984a; Richelson and Pfenning 1984b; Potter et al. 1995.
  Crowell-Davis, Murray 2006
Medication Choices - Cats

<table>
<thead>
<tr>
<th>Drug Class</th>
<th>Drug Name</th>
<th>Dose</th>
<th>Side Effects</th>
<th>Schedule</th>
</tr>
</thead>
<tbody>
<tr>
<td>Selective Serotonin Reuptake Inhibitor (SSRI)</td>
<td>Fluoxetine (Prozac®)</td>
<td>0.5-1 mg/kg</td>
<td>Sleepiness or irritability, inappetence</td>
<td>PO q 24 hrs</td>
</tr>
<tr>
<td>Selective Serotonin Reuptake Inhibitor (SSRI)</td>
<td>Paroxetine (Paxil®)</td>
<td>0.25-1 mg/kg</td>
<td>Mild GIT side effects - watch inappetence, constipation</td>
<td>PO q 24 hrs</td>
</tr>
<tr>
<td>Azapirone Antidepressant (Buspar®)</td>
<td>Buspirone</td>
<td>0.5-1 mg/kg OR 2.5-7.5 mg/CAT</td>
<td>Side effects uncommon; increased assertiveness, friendliness</td>
<td>PO q12-24 hrs</td>
</tr>
</tbody>
</table>

Myths About Behavior Medication

- "It's just going to drug my dog."
- "It's going to change his personality."
- "He's going to become addicted."
- "It will decrease his adoptability."

Outline

- When to prescribe
- Monitoring
- Medication choices
- Outcome considerations
- Case examples

Outcome Considerations

- Post-outcome plan
  - Who does adoption counseling/ advises next group of situation?
    - Requirements might vary from state to state
  - Management/ education plan to go with dog
  - Full disclosure a requirement
  - Give recommendation for who the next group should follow up with
    - Veterinarian, you, qualified training group

Adoption vs. Transfer

- Adoption
  - New owner educated about medication
    - Goals, how to give, what to watch for, who to follow up with
  - Plan for continuation or weaning
    - Importance of compliance
    - Discussion of risk of stopping medication abruptly
  - Wean before adoption?

Adoption vs. Transfer

- Transfer to another organization
  - Shelter, rescue group, foster
  - Organization's philosophy/policies on behavioral medications
  - Plan for continuation or weaning
    - Discussion of risk of stopping medication abruptly
  - Wean before transfer?
Conclusions

- Several uses for behavior medications in shelter medicine
- Need to consider treatment goals, risk assessment, quality of life, shelter’s resources and shelter’s community before deciding to add behavior medication to treatment/management plan
- Special consideration to different aspects of medications for use in shelter
  - Cost & availability, frequency & route of dosing, time to effect, abuse potential
- Need to have a plan for monitoring, follow up, and post-outcome management

Teddy

- Signalment: 8 mo old M(I) German Shepherd Dog
  - 60 lb/27.3 kg, BCS: 4/9
- Medical history
  - Very thin, diarrhea
  - Housed at animal hospital prior to foster
  - EPI ruled out
  - Tylan powder 1/8 tsp PO q 12 hrs
- Behavioral history
  - Obtained by breed rescue 6-8 weeks ago from municipal animal control
  - Stray
  - Was noted to chase his tail while at animal control and animal hospital

Case Examples…

Teddy

- What do you think is going on with Teddy?
  - Differential diagnosis
    - Displacement/ stereotypic behavior due to Kennel stress
    - Compulsive disorder
    - Neurologic- atypical seizure disorder
    - Other medical? Anal glands, parasites, perianal fistulas
  - What the rescue thought
    - Kennel stress

Thank You for Your Time!

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  - Email: sara_bennett@ncsu.edu
  - Phone: 919-513-6130
  - Patient inquiries? To Behavioral Medicine Service:
    - http://www.ncsubehavior.com/
    - E-mail: ncstatevetbehavior@ncsu.edu
    - Phone: 919-513-6999

Teddy

- Where I came in…
  - 4 weeks after placement in foster home
  - Chase tail any time highly aroused-
    - At dog park before gets tennis ball
    - When tennis ball taken away
    - In the car
    - Any time goes into the bathroom (Teddy loves a bath)
    - In the exam room
      - Many times, with mouth wide open!
Teddy

Where I came in…
- If not interrupted, do this indefinitely
- Turn in both directions
- Has caught tail but not injured it yet
- Growl and snarl if other dog barks at him or someone reaches in to stop him
- Ran into objects, animals and people while doing this, injuring his face

Additional behavior history
- Does not chase tail in crate
- Teddy also constantly needs his tennis ball
  - Taking it away will trigger tail chasing
  - Will search for it once taken away
- Will also weave back and forth in the curtains (trancing)
  - Foster feels that this is consistent with Teddy wanting to go outside

Now what do you think?

What I thought
- Compulsive disorder
  - Did not resolve once out of stressful situation and medical treatment implemented
  - Triggered by high arousal - excitement, frustration, anxiety
  - Difficult to interrupt
  - Both directions
  - Other comorbid compulsive behaviors
    - tennis ball searching, trancing

Treatment
- Fluoxetine 20 mg - 2 PO q 24 hrs
- Discontinue punishment and aversives
- Consistent routine and interactions
- Foundation training - alternate behaviors
  - Hand targeting, relax on mat
- Response substitution

Outcome
- Diarrhea resolved
- Tail chasing improved 70%
- Adopted to new home
  - Experience with GSDs
  - Comfortable managing his behavior and medications

Conclusions

- Several uses for behavior medications in shelter medicine
- Need to consider treatment goals, risk assessment, quality of life, shelter’s resources and shelter’s community before deciding to add behavior medication to treatment/management plan
- Special consideration to different aspects of medications for use in shelter
  - Cost & availability, frequency & route of dosing, time to effect, abuse potential
- Need to have a plan for monitoring, follow up, and post-outcome management

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- Patient inquiries? To Behavioral Medicine Service:
  - http://www.ncsubehavior.com/
  - E-mail: ncstatevetbehavior@ncsu.edu
  - Phone: 919-513-6999