original xylazine if you suspect that the horse will be difficult to tranquilize (*e.g.*, high-strung Thoroughbreds) or added before the ketamine. This combination will improve induction, increase analgesia and increase recumbency time by about 5–10 minutes. **3**) Diazepam (0.03 mg/kg IV). Mix the diazepam with the ketamine. This combination will improve induction when sedation is marginal, improve muscle relaxation during anesthesia and prolong anesthesia by about 5–10 minutes. **4**) Guaifenesin (5% solution administered IV to effect) can also be used to increase sedation and muscle relaxation. (Mathews 1999)

- **SHEEP & GOATS:**

Note: Use xylazine with extreme caution in these species.

a) 0.05–0.1 mg/kg IV; 0.1–0.22 mg/kg IM (Thurmon and Benson 1986)

b) 0.044–0.11 mg/kg IV; 0.22 mg/kg IM (Mandsager 1988)

- **EXOTICS:**

a) An extensive list of suggested dosages can be found on page 359 of Veterinary Pharmacology and Therapeutics, 6th Ed., Booth, NH and McDonald, LE, Eds. 1988; Iowa State University Press; Ames, Iowa

Monitoring

- Level of anesthesia/analgesia
- Respiratory function; cardiovascular status (rate, rhythm, BP if possible)
- Hydration status if polyuria present

Client Information

- Xylazine should only be used by individuals familiar with its use

Chemistry/Synonyms

Xylazine HCl is a alpha$_2$-adrenergic agonist structurally related to clonidine. The pH of the commercially prepared injections is approximately 5.5. Dosages and bottle concentrations are expressed in terms of the base.

Xylazine HCl may also be known as Bay-Va-1470, *Rompun*®, *AnaSed*®, *Sedazine*®, *X-Ject*®, or *Xyla-Ject*®.

Storage/Stability/Compatibility

Do not store above 30°C (86°F). Xylazine is reportedly physically **compatible** in the same syringe with several compounds, including: acepromazine, buprenorphine, butorphanol, chloral hydrate, and meperidine.

Dosage Forms/Regulatory Status

VETERINARY-LABELED PRODUCTS:

Xylazine Injection: 20 mg/mL in 20 mL vials or 100 mg/mL in 50 mL vials: *AnaSed*® (Lloyd); *X-Ject*® (Butler); *Xyla-Ject*® (Phoenix); *Sedazine*® (Fort Dodge); *TranquiVed*® (Vedco); generic; (Rx); Approved for use (depending on strength and product) in dogs, cats, horses, deer, and elk.

While xylazine is not approved for use in cattle in the USA, at labeled doses in Canada it reportedly has been assigned withdrawal times of 3 days for meat and 48 hours for milk. FARAD has reportedly suggested a withdrawal of 7 days for meat and 72 hours for milk for extra-label use.

The ARCI (Racing Commissioners International) has designated this drug as a class 3 substance. See the appendix for more information.

HUMAN-LABELED PRODUCTS: None

YOHIMBINE HCL

(yo-*him*-been) Yobine®, Antagonil®

ALPHA$_2$-ADRENERGIC ANTAGONIST

Prescriber Highlights

- Alpha$_2$-adrenergic antagonist used to reverse xylazine & potentially amitraz; may be used prophylactically before amitraz dips
- Contraindications: Hypersensitivity to it. Caution: Renal disease, seizure disorders
- Adverse Effects: Transient apprehension or CNS excitement, muscle tremors, salivation, increased respiratory rates, & hyperemic mucous membranes; more likely in small animals
- Drug interactions

Uses/Indications

Yohimbine is indicated to reverse the effects of xylazine in dogs, but it is being used clinically in several other species as well.

Yohimbine may be efficacious in reversing some of the toxic effects associated with other agents (*e.g.*, amitraz) and can be used prophylactically before amitraz dips.

Pharmacology/Actions

Yohimbine is an alpha$_2$-adrenergic antagonist that can antagonize the effects of xylazine. Alone, yohimbine increases heart rate, blood pressure, causes CNS stimulation and antidiuresis, and has hyperinsulinemic effects.

By blocking central alpha$_2$-receptors, yohimbine causes sympathetic outflow (norepinephrine) to be enhanced. Peripheral alpha$_2$-receptors are also found in the cardiovascular system, genitourinary system, GI tract, platelets, and adipose tissue.

Pharmacokinetics

The pharmacokinetics of this drug have been reported in steers, dogs, and horses (Jernigan et al. 1988). The apparent volume of distribution (steady-state) is approximately 5 L/kg in steers, 2–5 L/kg in horses, and 4.5 L/kg in dogs. The total body clearance is approximately 70 mL/min/kg in steers, 35 mL/min/kg in horses, and 30 mL/min/kg in dogs. The half-life of the drug is approximately 0.5–1 hours in steers, 0.5–1.5 hours in horses, and 1.5–2 hours in dogs.

Yohimbine is believed to penetrate the CNS quite readily and, when used to reverse the effects of xylazine, onset of action generally occurs within 3 minutes. The metabolic fate of the drug is not known.

Contraindications/Precautions/Warnings

Yohimbine is contraindicated in patients hypersensitive to it. In humans, yohimbine is contraindicated in patients with renal disease.

Yohimbine should be used cautiously in patients with seizure disorders. When used to reverse the effects xylazine, normal pain perception may result.

Adverse Effects

Yohimbine may cause transient apprehension or CNS excitement, muscle tremors, salivation, increased respiratory rates, and hyperemic mucous membranes. Adverse effects appear to be more probable in small animals than in large animals.

Reproductive/Nursing Safety
Safe use of yohimbine in pregnant animals has not been established. No information on safety during lactation was located.

Overdosage/Acute Toxicity
Dogs receiving 0.55 mg/kg (5 times recommended dose) exhibited clinical signs of transient seizures and muscle tremors.

There were 51 exposures to yohimbine reported to the ASPCA Animal Poison Control Center (APCC; www.apcc.aspca.org) during 2005–2006. In these cases 46 were dogs with 9 showing clinical signs and the remaining 5 cases were cats with 1 showing clinical signs. Common findings in dogs recorded in decreasing frequency included panting, tachycardia, agitation, hypertension and anxiety. Common findings in cats recorded in decreasing frequency included hyperactivity, tachycardia, tachypnea and tremors.

Drug Interactions
Little information is available, use with caution with **other alpha$_2$-adrenergic antagonists** or **other drugs that can cause CNS stimulation**.

The following drug interaction has been reported in humans receiving yohimbine and may be of significance in veterinary patients:

- **TRICYCLIC ANTIDEPRESSANTS:** In humans, yohimbine is not recommended for use with antidepressants or other mood-altering agents; hypertension has been reported with tricyclics

Doses
- **DOGS:**

  For xylazine reversal:
  a) 0.11 mg/kg IV slowly (Package insert; *Yobine*®—Lloyd)
  b) 0.1 mg/kg IV (Gross and Tranquilli 1989)
  c) As an antiemetic: 0.25–0.5 mg/kg q12h SC or IM (Washabau and Elie 1995)

  For reversal or prevention of amitraz effects:
  a) To reverse centrally mediated bradycardia and hypotension associated with amitraz ingestion: 0.1 mg/kg IV; repeat as necessary (Manning 2000)
  b) In cases of toxicity or to prevent a dog from having an acute episode of toxicity associated with demodicosis treatment: Yohimbine at 0.11 mg/kg IV or 0.25 mg/kg IM with atipamezole (50 mcg/kg IM). (Torres 2007b)
  c) For treatment or prevention of side effects associated with amitraz dips: 0.1 mg/kg IV; may give prior to, or after bathing to prevent effects. (Hillier 2006g)

- **RABBITS, RODENTS, SMALL MAMMALS:**

  To reverse the effects of xylazine and to partially antagonize the effects of ketamine and acepromazine:
  a) Rabbits: 0.2 mg/kg IV as needed
  b) Mice/Rats: 0.2 mg/kg IP as needed (Huerkamp 1995)

- **BIRDS:**

  As a reversal agent for alpha2-adrenergic agonists (*e.g.*, xylazine):
  a) 0.1 mg/kg IV (Clyde and Paul-Murphy 2000)

- **CATTLE:**

  For xylazine reversal:
  a) 0.125 mg/kg IV (Gross and Tranquilli 1989)

- **HORSES:** (**Note:** ARCI UCGFS Class 2 Drug)

  For xylazine reversal:
  a) 0.075 mg/kg IV (Gross and Tranquilli 1989)

- **LLAMAS:**

  For xylazine reversal:
  a) 0.25 mg/kg IV or IM (Fowler 1989)

- **DEER:**

  For xylazine reversal:
  a) In wild, exotic and ranched deer: 0.2–0.3 mg/kg IV (Package Insert; *Antagonil*®—Wildlife Labs)

  Note: Yohimbine has also been used as a reversal agent in several exotic species. Several dosages are listed in the chapter on Stimulants by Booth in Veterinary Pharmacology and Therapeutics, 6th Edition. Booth, NH and McDonald, LE Eds., Iowa State University Press. Ames. 1988

Monitoring
- CNS status (arousal level, etc.)
- Cardiac rate; rhythm (if indicated), blood pressure (if indicated and practical)
- Respiratory rate

Client Information
- This agent should be used with direct professional supervision only

Chemistry/Synonyms
A Rauwolfia or indolealkylamine alkaloid, yohimbine HCl has a molecular weight of 390.9. It is chemically related to reserpine.

Yohimbine may also be known as: aphrodine hydrochloride, chlorhydrate de quebrachine, corynine hydrochloride, *Aphrodyne*®, *Dayto Himbin*®, *Pluriviron mono*®, *Prowess Plain*®, *Urobine*®, *Virigen*®, *Yobine*®, *Yocon*®, *Yocoral*®, *Yohimex*®, *Yohydrol*, *Yomax*®, or *Zumba*®.

Storage/Stability/Compatibility
Yohimbine injection should be stored at room temperature (15–30°C) and protected from light and heat.

Dosage Forms/Regulatory Status
VETERINARY-LABELED PRODUCTS:

Yohimbine Sterile Solution for Injection: 2 mg/mL in 20 mL vials; *Yobine*® (Lloyd); (Rx). Approved for use in dogs.

HUMAN-LABELED PRODUCTS:

Oral 5.4 mg tablets are available, but would unlikely to be of veterinary benefit.

ZAFIRLUKAST
(zah-***fur***-luh-kast) Accolate®

LEUKOTRIENE-RECEPTOR ANTAGONIST

Prescriber Highlights
- Leukotriene-receptor antagonist used primarily for feline asthma; appears to have very limited efficacy
- Not for treatment of acute bronchospasm
- Well tolerated
- Dose on an empty stomach

Uses/Indications
While zafirlukast potentially could be useful in treating feline asthma, including allowing dose reductions of corticosteroid therapy, its efficacy has been disappointing to this point and most do not recommend its use. Potentially, it could be of benefit in allergy-mediated (where leukotrienes play a role) dermatologic condi-