Monitoring
- Clinical efficacy
- For pregnancy termination: ultrasound 10 days after treatment and at least 30 days after mating
- Adverse effects (see above)

Client Information
- Only veterinary professionals should handle and administer this product
- When used for pregnancy termination in the bitch, clients should understand that aglepristone might only be 95% effective in terminating pregnancy when used between days 26–45
- A brown mucoid vaginal discharge can be seen approximately 24 hours before fetal expulsion
- Bitch may exhibit the following after treatment: lack of appetite, excitement, restlessness or depression, vomiting, or diarrhea
- Clients should be instructed to contact veterinarian if bitch exhibits a purulent or hemorrhagic discharge after treatment or if vaginal discharge persists 3 weeks after treatment

Chemistry/Synonyms
Aglepristone is a synthetic steroid. The manufactured injectable dosage form is in a clear, yellow, oily, non-aqueous vehicle that contains arachis oil and ethanol. No additional antimicrobial agent is added to the injection.

Aglepristone may also be known as RU-534, *Alizine*®, or *Alizin*®.

Storage/Stability/Compatibility
Aglepristone injection should be stored below 25°C and protected from light. The manufacturer recommends using the product within 28 days of withdrawing the first dose.

Although no incompatibilities have been reported, due to the product's oil/alcohol vehicle formulation it should not be mixed with any other medication.

Dosage Forms/Regulatory Status
VETERINARY-LABELED PRODUCTS:

Note: Not presently available or approved for use in the USA. In several countries:

Aglepristone 30 mg/mL in 5 mL and 10 mL vials; *Alizine*® or *Alizin*® (Virbac); (Rx)

The FDA may allow legal importation of this medication for compassionate use in animals; for more information, see the *Instructions for Legally Importing Drugs for Compassionate Use in the USA* found in the appendix.

HUMAN-LABELED PRODUCTS: None

ALBENDAZOLE

(al-***ben***-da-zole) Albenza®, Valbazen®

ANTIPARASITIC

Prescriber Highlights
- **Broad spectrum against a variety of nematodes, cestodes & protozoa; labeled for cattle & sheep (suspension only)**
- **Contraindicated with hepatic failure, pregnancy, lactating dairy cattle**
- **May cause GI effects (including hepatic dysfunction) & rarely blood dyscrasias (aplastic anemia)**
- **Do not use in pigeons, doves or crias**

Uses/Indications
Albendazole is labeled for the following endoparasites of cattle (not lactating): *Ostertagia ostertagi, Haemonchus* spp., *Trichostrongylus* spp., *Nematodius* spp., *Cooperia* spp., *Bunostomum phlebotomum, Oesphagostomum* spp., *Dictacaulus vivaparus* (adult and 4th stage larva), *Fasciola hepatica* (adults), and *Moniezia* spp.

In sheep, albendazole is approved for treating the following endoparasites: *Ostertagia circumcincta, Marshallagia marshalli, Haemonchus contortus*, *Trichostrongylus* spp., *Nematodius* spp., *Cooperia* spp., *Oesphagostomum* spp., *Chibertia ovina*, *Dictacaulus filaria*, *Fasciola hepatica*, *Fascioides magna*, *Moniezia expansa*, and *Thysanosoma actinoides*.

Albendazole is also used (extra-label) in small mammals, goats and swine for endoparasite control.

In cats, albendazole has been used to treat *Paragonimus kellicotti* infections. In dogs and cats, albendazole has been used to treat capillariasis. In dogs, albendazole has been used to treat Filaroides infections. It has been used for treating giardia infections in small animals, but concerns about bone marrow toxicity have diminished enthusiasm for the drug's use.

Pharmacology/Actions
Benzimidazole antiparasitic agents have a broad spectrum of activity against a variety of pathogenic internal parasites. In susceptible parasites, their mechanism of action is believed due to disrupting intracellular microtubular transport systems by binding selectively and damaging tubulin, preventing tubulin polymerization, and inhibiting microtubule formation. Benzimidazoles also act at higher concentrations to disrupt metabolic pathways within the helminth, and inhibit metabolic enzymes, including malate dehydrogenase and fumarate reductase.

Pharmacokinetics
Pharmacokinetic data for albendazole in cattle, dogs and cats was not located. The drug is thought better absorbed orally than other benzimidazoles. Approximately 47% of an oral dose was recovered (as metabolites) in the urine over a 9-day period.

After oral dosing in sheep, the parent compound was either not detectable or only transiently detectable in plasma due to a very rapid first-pass effect. The active metabolites, albendazole sulphoxide and albendazole sulfone, reached peak plasma concentrations 20 hours after dosing.

Contraindications/Precautions/Warnings

The drug is not approved for use in lactating dairy cattle. The manufacturer recommends not administering to female cattle during the first 45 days of pregnancy or for 45 days after removal of bulls. In sheep, it should not be administered to ewes during the first 30 days of pregnancy or for 30 days after removal of rams.

Pigeons and doves may be susceptible to albendazole and fenbendazole toxicity (intestinal crypt epithelial necrosis and bone marrow hypoplasia).

Nine alpaca crias receiving albendazole at dosages from 33–100 mg/kg/day once daily for 4 consecutive days developed neutropenia and severe watery diarrhea. All required treatment and 7 of 9 animals treated died or were euthanized secondary to sepsis or multiple organ failure. (Gruntman and Nolen-Walston 2006)

In humans, caution is recommended for use in patients with liver or hematologic diseases.

Albendazole was implicated as being an oncogen in 1984, but subsequent studies were unable to demonstrate any oncogenic or carcinogenic activity of the drug.

Adverse Effects

Albendazole is tolerated without significant adverse effects when dosed in cattle or sheep at recommended dosages.

Dogs treated at 50 mg/kg twice daily may develop anorexia. Cats may exhibit clinical signs of mild lethargy, depression, anorexia, and resistance to receiving the medication when albendazole is used to treat Paragonimus. Albendazole has been implicated in causing aplastic anemia in dogs, cats, and humans.

Reproductive/Nursing Safety

Albendazole has been associated with teratogenic and embryotoxic effects in rats, rabbits and sheep when given early in pregnancy. The manufacturer recommends not administering to female cattle during the first 45 days of pregnancy or for 45 days after removal of bulls. In sheep, it should not be administered to ewes during the first 30 days of pregnancy or for 30 days after removal of rams.

In humans, the FDA categorizes this drug as category ***C*** for use during pregnancy (*Animal studies have shown an adverse effect on the fetus, but there are no adequate studies in humans; or there are no animal reproduction studies and no adequate studies in humans.*)

Safety during nursing has not been established.

Overdosage/Toxicity

Doses of 300 mg/kg (30X recommended) and 200 mg/kg (20X) have caused death in cattle and sheep, respectively. Doses of 45 mg/kg (4.5X those recommended) did not cause any adverse effects in cattle tested. Cats receiving 100 mg/kg/day for 14–21 days showed signs of weight loss, neutropenia and mental dullness.

Drug Interactions

The following drug interactions have either been reported or are theoretical in humans or animals receiving albendazole and may be of significance in veterinary patients:

- **CIMETIDINE**: Increased albendazole levels in bile and cystic fluid
- **DEXAMETHASONE**: May increase albendazole serum levels
- **PRAZIQUANTEL**: May increase albendazole serum levels

Doses

- **DOGS:**

For *Filaroides hirthi* infections:

a) 50 mg/kg q12h PO for 5 days; repeat in 21 days. Clinical signs may suddenly worsen during therapy, presumably due to a reaction to worm death. (Hawkins, Ettinger, and Suter 1989)

b) 25 mg/kg PO q12h for 5 days; may repeat in 2 weeks (also for Oslerus osleri) (Reinemeyer 1995)

For *Filaroides osleri* (also known as *Oslerus osleri*) infections:

a) 9.5 mg/kg for 55 days or 25 mg/kg PO twice daily for 5 days. Repeat therapy in 2 weeks. (Todd, Paul, and DiPietro 1985)

For *Capillaria plica*:

a) 50 mg/kg q12h for 10–14 days. May cause anorexia. (Brown and Barsanti 1989)

For *Paragonimus kellicotti*:

a) 50 mg/kg PO per day for 21 days (Roberson 1988b)

b) 30 mg/kg once daily for 12 days (Todd, Paul, and DiPietro 1985)

c) 25 mg/kg PO q12h for 14 days (Reinemeyer 1995)

For Giardia:

a) 25 mg/kg PO q12h for 4 doses (Barr, Bowman et al.)

b) 25 mg/kg PO twice daily for 5 days (Barr and Bowman 1994)

c) 25 mg/kg PO twice daily for 2–5 days (Lappin 2000)

For Leishmaniasis:

a) 10 mg/kg PO once daily for 30 days or 5 mg/kg PO q6h for 60 days (Greene and Watson 1998)

- **CATS:**

For *Paragonimus kellicotti*:

a) 50 mg/kg PO per day for 21 days (Roberson 1988b)

b) 25 mg/kg PO q12h for 10–21 days (Hawkins, Ettinger, and Suter 1989)

c) 30 mg/kg once a day for 6 days (Todd, Paul, and DiPietro 1985)]

d) 25 mg/kg PO q12h for 14 days (Reinemeyer 1995)

For Giardia:

a) 25 mg/kg PO twice daily for 5 days (Barr and Bowman 1994)

b) 25 mg/kg PO q12h for 3–5 days; may cause bone marrow suppression in dogs and cats. (Vasilopulos 2006)

For treatment of liver flukes (Platynosum or Opisthorchiidae families):

a) 50 mg/kg PO once daily until ova are gone (Taboada 1999)

- **RABBITS/RODENTS/SMALL MAMMALS:**

a) Rabbits: For Encephalitozoon phacoclastic uveitis: 30 mg/kg PO once daily for 30 days, then 15 mg/kg PO once daily for 30 days (Ivey and Morrisey 2000)

b) Chinchillas: For Giardia: 50–100 mg/kg PO once a day for 3 days (Hayes 2000)

- **CATTLE:**

For susceptible parasites:

a) 10 mg/kg PO (Labeled directions; *Valbazen®*—Pfizer)

b) 7.5 mg/kg PO; 15 mg/kg PO for adult liver flukes (Roberson 1988b)

c) For adult liver flukes: 10 mg/kg PO; best used in fall when the majority are adults (little or no efficacy against immature forms). A second treatment in winter may be beneficial. (Herd 1986b)

d) For gastrointestinal cestodes: 10 mg/kg PO (Herd 1986a)

- **SWINE:**

For susceptible parasites:

a) 5–10 mg/kg PO (Roberson 1988b)

- **SHEEP & GOATS:**

For susceptible parasites:

a) 7.5 mg/kg PO (0.75 mL of the suspension per 25 lb. body weight). (Labeled directions; *Valbazen® Suspension*—Pfizer)

b) 7.5 mg/kg PO; 15 mg/kg PO for adult liver flukes (Roberson 1988b)

c) For adult liver flukes in sheep: 7.6 mg/kg (Paul 1986)
d) For treatment of nematodes in sheep: 3 mL of suspension per 100 lbs of body weight PO (Bulgin 2003)

- **BIRDS:**
  a) Ratites: Using the suspension: 1 mL/22 kg of body weight twice daily for 3 days; repeat in 2 weeks. Has efficacy against flagellate parasites and tapeworms. (Jenson 1998)

Monitoring
- Efficacy
- Adverse effects if used in non-approved species or at dosages higher than recommended
- Consider monitoring CBC's and liver enzymes (q4–6 weeks) if treating long-term (>1 month)

Client Information
- Shake well before administering
- Contact veterinarian if adverse effects occur (*e.g.*, vomiting, diarrhea, yellowish sclera/mucous membranes or skin)

Chemistry/Synonyms
A benzimidazole anthelmintic structurally related to mebendazole, albendazole has a molecular weight of 265. It is insoluble in water and soluble in alcohol.

Albendazole may also be known as. Albendazole may also be known by these synonyms: albendazolum, SKF-62979, *Valbazen®* or *Albenza®*; many other trade names are available.

Storage/Stability
Albendazole suspension should be stored at room temperature (15–30°C); protect from freezing. Shake well before using. Albendazole paste should be stored at controlled room temperature (15–30°C); protect from freezing.

Dosage Forms/ Regulatory Status
VETERINARY-LABELED PRODUCTS:

Albendazole Suspension: 113.6 mg/mL (11.36%) in 500 mL, 1 liter, 5 liters; *Valbazen® Suspension* (Pfizer); (OTC). Approved for use in cattle (not female cattle during first 45 days of pregnancy or for 45 days after removal of bulls, or of breeding age) and sheep (do not administer to ewes during the first 30 days of pregnancy or for 30 days after removal of rams). Slaughter withdrawal for cattle = 27 days at labeled doses. Slaughter withdrawal for sheep = 7 days at labeled dose. Since milk withdrawal time has not been established, do not use in female dairy cattle of breeding age.)

Albendazole Paste: 30% in 205 g (7.2 oz); *Valbazen®* (Pfizer); (OTC). Approved for use in cattle (not female cattle during first 45 days of pregnancy or for 45 days after removal of bulls or of breeding age). Slaughter withdrawal = 27 days at labeled doses. Since withdrawal time in milk has not been established, do not use in female dairy cattle of breeding age.

HUMAN-LABELED PRODUCTS:

Albendazole Tablets: 200 mg; *Albenza®* (SmithKline Beecham); (Rx)

ALBUTEROL SULFATE

(al-*byoo*-ter-ole) Salbutamol, Proventil®, Ventolin®

BETA-ADRENERGIC AGONIST

Prescriber Highlights
- Used primarily as a bronchodilator after PO or inhaled dosing
- Use with caution in patients with cardiac dysrhythmias or dysfunction, seizure disorders, hypertension or hyperthyroidism
- May be teratogenic (high doses) or delay labor

Uses/Indications
Albuterol is used principally in dogs and cats for its effects on bronchial smooth muscle to alleviate bronchospasm or cough. It is also used in horses as a bronchodilator.

Pharmacology/Actions
Like other beta-agonists, albuterol is believed to act by stimulating production of cyclic AMP through activation of adenyl cyclase. Albuterol is considered to be predominantly a $beta_2$ agonist (relaxation of bronchial, uterine, and vascular smooth muscles). At usual doses, albuterol possesses minimal $beta_1$ agonist (heart) activity. Beta-adrenergics can promote a shift of potassium away from the serum and into the cell, perhaps via stimulation of Na^+-K^+-ATPase. Temporary decreases in either normal or high serum potassium levels are possible.

Pharmacokinetics
The specific pharmacokinetics of this agent have apparently not been thoroughly studied in domestic animals. In general, albuterol is absorbed rapidly and well after oral administration. Effects occur within 5 minutes after oral inhalation; 30 minutes after oral administration (*e.g.*, tablets). It does not cross the blood-brain barrier but does cross the placenta. Duration of effect generally persists for 3–6 hours after inhalation and up to 12 hours (depending on dosage form) after oral administration. The drug is extensively metabolized in the liver principally to the inactive metabolite, albuterol 4'-O-sulfate. After oral administration the serum half-life in humans has been reported as 2.7–5 hours.

Contraindications/Precautions/Warnings
Albuterol is contraindicated in patients hypersensitive to it. It should be used with caution in patients with diabetes, hyperthyroidism, hypertension, seizure disorders, or cardiac disease (especially with concurrent arrhythmias).

Use during the late stages of pregnancy may inhibit uterine contractions.

Adverse Effects
Most adverse effects are dose-related and those that would be expected with sympathomimetic agents including increased heart rate, tremors, CNS excitement (nervousness) and dizziness. These effects are generally transient and mild and usually do not require discontinuation of therapy. Decreased serum potassium values may be noted; rarely is potassium supplementation required.

Some cats don't like the "hiss" occurring during actuation of the metered-dose inhaler or the taste of the drug/vehicle.