

# Treatment of Acute Hemoabdomen

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Penelope, a 6-year-old, 44-lb, spayed pit bull terrier, presented 10 minutes after being struck by a vehicle traveling 35 miles per hour.

## Physical Examination

Penelope had a heart rate of 200 bpm, respiratory rate of 32 breaths/min, and temperature of 99.8°F. She was obtunded and laterally recumbent. Mucous membranes were pale pink to white and moist with a prolonged capillary refill time (CRT) of 3 seconds. Femoral pulses were weak. She had normal heart and lung sounds. Penelope's abdomen was tense and painful on palpation. No orthopedic or neurologic abnormalities were detected. A Doppler blood pressure of 80 mm Hg was recorded.

## Laboratory Results

PCV was 40% (range, 35%–55%) and total protein (TP) was 3.2 g/dL (range, 5.2–7.8 g/dL). Irregularities in the biochemistry profile were present (Table). Coagulation times (prothrombin and partial thromboplastin) were normal. The lactate level was 6.4 mmol/L (range, 1.2–4.14 mmol/L).

## Treatment

IV fluid resuscitation was initiated with several rapid infusions totaling 70 mL/kg of crystalloids (Plasmalyte-A, abbottanimalhealth.com), 20 mL/kg colloids (hydroxyethyl starch), and the only unit of stored whole blood (450 mL). Penelope was administered 0.1 mg/kg of IV hydromorphone but remained tachycardic (180 bpm) and had weak pulses. An abdominal fluid wave was noted; abdominocentesis revealed a hemorrhagic effusion with a PCV of 34% and TP of 2.8 g/dL. A recheck revealed peripheral blood PCV of 20% and TP of 2.2 g/dL.

CRT = capillary refill time, TP = total protein

## Ask Yourself



What is the best next step for Penelope?

- Because she seemed stable, she could be safely transferred to the specialty hospital 1 hour away.
- Because she seemed stable, she should continue to be monitored in the hospital and receive pain medication.
- Because she was not stable, only IV crystalloid therapy should be continued.
- Because she was not stable, IV crystalloid therapy should be continued and autologous blood transfusion considered.
- Because she was not stable, IV crystalloid therapy should be considered and a blood donor retrieved.

## Table Abnormal Biochemistry Profile Findings

Parameter	Result	Reference
Alanine aminotransferase (U/L)	120	10–100
Alkaline phosphatase (U/L)	320	6–102
Albumin (g/dL)	2.2	2.5–3.9
Blood glucose (mg/dL)	180	64–170

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**CORRECT ANSWER**

**D. Because she was not stable, IV crystalloid therapy should be continued and autologous blood transfusion considered.**

Life-threatening hemorrhage is not uncommon in veterinary emergency medicine. Knowing how to approach these cases can make the difference between life and death.

The most common reasons for intraabdominal hemorrhage are:

- Gastric dilatation-volvulus
- Ruptured tumors
- Trauma
- Coagulopathies (eg, from anticoagulant rodenticide ingestion)

When significant hemorrhage has occurred, inadequate intravascular volume and decreased hemoglobin can lead to poor oxygen delivery and shock. Basic examination findings and laboratory tests can allow rapid assessment for shock and hemorrhage. Shock can be easily and quickly detected, noting alterations in heart rate, gum color, CRT, pulse quality, and mentation. A patient with a drop in total solids (TS) relative to PCV may indicate hemorrhage has occurred or is ongoing. After fluid resuscitation, a drop in both PCV and TS is expected. A cavity blood sample that demonstrates a PCV and TS equal to or higher than peripheral blood is consistent with acute hemorrhage. Imaging with a focused assessment with sonography for trauma (FAST) scan or radiographs should not delay treatment of a patient in shock.

**BENEFITS, RISKS, & TECHNIQUES FOR AUTOLOGOUS TRANSFUSIONS**

Hemorrhage into the thoracic or abdominal cavities can be quickly collected and administered IV. Autologous blood has been demonstrated to be lifesaving, safe, and advantageous (see **Suggested Reading**).

**Benefits**

- Simple to collect and administer
- Frequently sterile
- Contains functionally superior cells compared with banked blood
- Does not require warming
- Decreased risk for transfusion reactions from foreign protein
- Can be less expensive than banked blood
- Readily available

**Risks**

Potential complications attributable to autotransfusion include:

- Hypocoagulation
- Hemolysis
- Sepsis
- Dissemination of malignancy
- Embolism

**Techniques**

Blood can be suctioned out of the abdominal or thoracic cavity with

centesis or direct suction (in a surgical case). Blood should be collected directly into a sterile suction canister, IV fluid bag (**Figure 1**), commercial blood bag, or syringe (in smaller patients). Passing the blood through a filter is recommended. Adding anticoagulant is often unnecessary unless hemorrhage is ongoing at collection. Monitoring PCV, TS, electrolytes, and renal values is recommended.

**1** Auto-logous blood was collected in a sterile fashion and transferred into an empty sterile IV bag. It was administered IV through a filter, as shown here.



CRT = capillary refill time, TP = total protein, TS = total solids

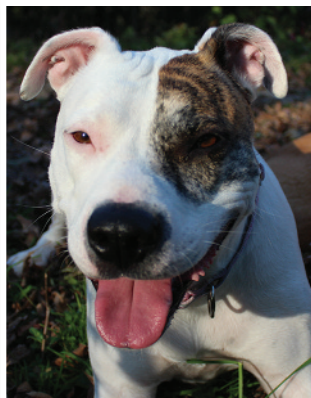
## Treatment Options

Mild hemorrhage often responds to IV replacement with crystalloids and colloids. Rapid infusions (over 10–15 min) of 20 to 30 mL/kg of crystalloids and 5 mL/kg of colloids are necessary and may need to be repeated. Patients with coagulopathies or severe hemorrhage may require blood products. When blood banks are stressed or large volumes are required, autologous transfusion remains a viable option.

The risk:benefit ratio weighs heavily in favor of autotransfusion for the resuscitation of select patients, even despite neoplasia or gross contamination, when facing exsanguination and death.

## Outcome

Penelope was taken to surgery where a large splenic laceration was identified as the source of ongoing hemorrhage; 900 mL of autologous blood was collected intraoperatively with a Poole suction tip into a sterile canister, transferred to a sterile IV bag, and administered IV. A splenectomy was performed, and the remainder of the exploratory laparotomy was unremarkable. Penelope recovered uneventfully from anesthesia and was discharged 48 hours later. Four weeks later, she was doing well and had returned to normal activity. ■ **cb**



**revolution**<sup>®</sup>  
(selamectin)

### Topical Parasiticide for Dogs and Cats

#### BRIEF SUMMARY:

See package insert for full prescribing information.

#### CAUTION:

US Federal law restricts this drug to use by or on the order of a licensed veterinarian.

#### INDICATIONS:

Revolution is recommended for use in dogs six weeks of age or older and cats eight weeks of age and older for the following parasites and indications:

#### Dogs:

Revolution kills adult fleas and prevents flea eggs from hatching for one month and is indicated for the prevention and control of flea infestations (*Ctenocephalides felis*), prevention of heartworm disease caused by *Dirofilaria immitis*, and the treatment and control of ear mite (*Otodectes cynotis*) infestations. Revolution also is indicated for the treatment and control of sarcoptic mange (*Sarcoptes scabiei*) and for the control of tick infestations due to *Dermacentor variabilis*.

#### Cats:

Revolution kills adult fleas and prevents flea eggs from hatching for one month and is indicated for the prevention and control of flea infestations (*Ctenocephalides felis*), prevention of heartworm disease caused by *Dirofilaria immitis*, and the treatment and control of ear mite (*Otodectes cynotis*) infestations. Revolution is also indicated for the treatment and control of roundworm (*Toxocara cati*) and intestinal hookworm (*Ancylostoma tubaeforme*) infections in cats.

#### WARNINGS:

**Not for human use. Keep out of the reach of children.**

In humans, Revolution may be irritating to skin and eyes. Reactions such as hives, itching and skin redness have been reported in humans in rare instances. Individuals with known hypersensitivity to Revolution should use the product with caution or consult a health care professional. Revolution contains isopropyl alcohol and the preservative butylated hydroxytoluene (BHT). Wash hands after use and wash off any product in contact with the skin immediately with soap and water. If contact with eyes occurs, then flush eyes copiously with water. In case of ingestion by a human, contact a physician immediately. The material safety data sheet (MSDS) provides more detailed occupational safety information. For a copy of the MSDS or to report adverse reactions attributable to exposure to this product, call 1-800-366-5288.

Flammable—Keep away from heat, sparks, open flames or other sources of ignition.

**Do not use in sick, debilitated or underweight animals. (see SAFETY)**

#### PRECAUTIONS:

Prior to administration of Revolution, dogs should be tested for existing heartworm infections. At the discretion of the veterinarian, infected dogs should be treated to remove adult heartworms. Revolution is not effective against adult *D. immitis* and, while the number of circulating microfilariae may decrease following treatment, Revolution is not effective for microfilariae clearance.

Hypersensitivity reactions have not been observed in dogs with patent heartworm infections administered three times the recommended dose of Revolution. Higher doses were not tested.

#### ADVERSE REACTIONS:

##### Pre-approval clinical trials:

Following treatment with Revolution, transient localized alopecia with or without inflammation at or near the site of application was observed in approximately 1% of 691 treated cats. Other signs observed rarely (<0.5% of 1743 treated cats and dogs) included vomiting, loose stool or diarrhea with or without blood, anorexia, lethargy, salivation, tachypnea, and muscle tremors.

##### Post-approval experience:

In addition to the aforementioned clinical signs that were reported in pre-approval clinical trials, there have been reports of pruritus, urticaria, erythema, ataxia, fever and rare reports of death. There have also been rare reports of seizures in dogs. (see WARNINGS)

#### SAFETY:

Revolution has been tested safe in over 100 different pure and mixed breeds of healthy dogs and over 15 different pure and mixed breeds of healthy cats, including pregnant and lactating females, breeding males and females, puppies six weeks of age and older, kittens eight weeks of age and older, and avermectin-sensitive collies. A kitten, estimated to be 5–6 weeks old (0.3 kg), died 8 1/2 hours after receiving a single treatment of Revolution at the recommended dosage. The kitten displayed clinical signs which included muscle spasms, salivation and neurological signs. The kitten was a stray with an unknown history and was malnourished and underweight (see WARNINGS).

**DOGS:** In safety studies, Revolution was administered at 1, 3, 5, and 10 times the recommended dose to six-week-old puppies, and no adverse reactions were observed. The safety of Revolution administered orally also was tested in case of accidental oral ingestion. Oral administration of Revolution at the recommended topical dose in 5- to 8-month-old beagles did not cause any adverse reactions.

In a pre-clinical study selamectin was dosed orally to ivermectin-sensitive collies. Oral administration of 2.5, 10, and 15 mg/kg in this dose escalating study did not cause any adverse reactions; however, eight hours after receiving 5 mg/kg orally, one avermectin-sensitive collie became ataxic for several hours, but did not show any other adverse reactions after receiving subsequent doses of 10 and 15 mg/kg orally. In a topical safety study conducted with avermectin-sensitive collies at 1, 3 and 5 times the recommended dose of Revolution, salivation was observed in all treatment groups, including the vehicle control. Revolution also was administered at 3 times the recommended dose to heartworm infected dogs, and no adverse effects were observed.

**CATS:** In safety studies, Revolution was applied at 1, 3, 5, and 10 times the recommended dose to six-week-old kittens. No adverse reactions were observed. The safety of Revolution administered orally also was tested in case of accidental oral ingestion. Oral administration of the recommended topical dose of Revolution to cats caused salivation and intermittent vomiting. Revolution also was applied at 4 times the recommended dose to patent heartworm infected cats, and no adverse reactions were observed.

In well-controlled clinical studies, Revolution was used safely in animals receiving other frequently used veterinary products such as vaccines, anthelmintics, antiparasitics, antibiotics, steroids, collars, shampoos and dips.

**STORAGE CONDITIONS:** Store below 30°C (86°F).

**HOW SUPPLIED:** Available in eight separate dose strengths for dogs and cats of different weights. Revolution for puppies and kittens is available in cartons containing 3 single dose tubes. Revolution for cats and dogs is available in cartons containing 3 or 6 single dose tubes.

NADA 141-152, Approved by FDA.

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## The Take-Home



- Life-threatening hypoperfusion (shock) can be easily detected during examination by assessing heart rate, gum color, CRT, mentation, and pulse quality.
- A drop in TS relative to PCV is an early pathologic sign of hemorrhage; decreases in PCV may not occur until fluids have been administered.
- Imaging should not delay treatment for shock.
- To provide intravascular volume and oxygen carrying capacity, autologous blood transfusion can be easily performed in patients suffering from life-threatening cavity hemorrhage when blood resources are unavailable or exhausted.

See Aids & Resources, back page, for references & suggested reading.