

*“Pearls”
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ANESTHESIOLOGY – NEW PRODUCTS

Heated humidified breathing circuit maintains body temperature in anesthetized dogs

Combining a circulating water blanket with a heated humidified breathing circuit **reduced the incidence of hypothermia from 66.7% to 12.5%** in the heated breathing circuit group. About 1/3 of the dogs required discontinuation of warming to prevent hyperthermia. The device used in this study can be obtained from [Jorvet and currently lists for \\$1990.00](#).

<https://avmajournals.avma.org/view/journals/javma/261/8/javma.23.01.0040.xml>
Cap Rep (2023).42(1):1

CARDIOLOGY- CLINICAL PATHOLOGY

Abnormal Feline SNAP proBNP assay suggests heart disease but is not a screening tool for occult disease

A study of 217 cats seen at 21 general practices (GP) suggests that the Idexx SNAP Feline proBNP is best used in cats with a heart murmur. **If the SNAP test is abnormal, there is a high probability the cat will have an abnormal echocardiogram.** However, a normal SNAP does not rule out heart disease and should not be used as a screening test to rule out occult heart disease. The authors state, “the combination of auscultating a heart murmur and obtaining a positive POC NT-proBNP test result would be expected to detect heart disease in a cat with no overt clinical cardiovascular signs in approximately 7 out of 10 cases.”

Ta-li lu, et al. J vet intern med. 2021;35:1663-1672
This research highlights several issues with feline heart murmurs. The authors note that cat murmurs are labile and vary from time to time. **Half the cats with murmurs had a normal echocardiogram so the murmur was physiological.** 16% of all apparently healthy cats had occult heart disease (no auscultable murmur but an abnormal echo). The **SNAP BNP differentiated cats in the abnormal from normal group with a sensitivity of only 43% but if the cat had a murmur, the sensitivity increased to 71%.** 13% of *all* cats had a normal SNAP but abnormal echo representing **57% false negative results** (28 cats had negative SNAP out of 49 cats with an abnormal echo). The findings are summarized in a [spreadsheet here](#). – ed

Cap Rep (2023).42(1):1

CLINICAL PATHOLOGY – GASTROENTEROLOGY

Protein C Activity Assay differentiates Microvascular Dysplasia (MVD) from Portosystemic Shunts (PSS)

Protein C is a vitamin-K dependent anticoagulant protein which is made by the liver and circulates in the plasma. When combined with thrombin on the endothelial surface, the activated Protein C disables Factors Va and VIIIa,



thereby regulating coagulation, preventing thromboembolism and maintaining endothelial cell integrity. **Protein C below 70% is suggestive of PSS; high bile acids, low albumin, low cholesterol and low MCV support the diagnosis of PSS.** Protein C less than 50% indicates severe liver insult such as from infection, aflatoxin toxicity, DIC or vitamin K deficiency/anticoagulant rodenticide poisoning.

[Protein C Testing is available through Cornell Animal Health Diagnostic Center](#); the cost is \$42.50 and requires at least 0.5 ml of plasma separated from a BTT, frozen with cold packs for overnight delivery. Fasting is not required but marked lipemia or hemolysis can interfere with the assay. Alternatively, you may request the test by calling your reference lab; expect an upcharge.

<https://www.vet.cornell.edu/animal-health-diagnostic-center/laboratories/comparative-coagulation/clinical-topics/protein-c>, accessed 8/20/2023;

https://en.wikipedia.org/wiki/Protein_C, accessed 8/20/2023
Cap Rep (2023).42(1):1-2

DERMATOLOGY - OTOLOGY

Excerpts from A Review of Recent Developments in Veterinary Otology by Richard Harvey, 2022:

Next-Generation-Sequencing-Based Assays (MiDog) used in diagnosing skin & ear infections

NGS is a new DNA extraction technology that can diagnose aerobic, anaerobic, and fungal infections of the skin and ears. In this study, 589 samples from the skin and ears of 332 animals identified 7846 bacterial and fungal species (~13 per site). **Healthy animals had a greater diversity of species whereas the diseased animals showed an overgrowth of 1-2 species.** [MiDog](#) sends [5 collection kits](#) for \$17.50 shipping. The cost of the test is \$138-145.

Tang, S. (2020). Vet Micro 247:108764, Cap Rep (2023).42(1):2

Apoquel for Ear Tip Ulcerative Dermatitis (ETUD)

ETUD is an uncommon cause of vasculitis, alopecia, and ulceration of the ear tips. **Apoquel at the typical atopic dermatitis dose resolved ETUD in 88% of dogs within 1-3 months**, though several required long-term BID dosing.

Colombo, S. (2021). Vet Derm 32(4):363-e100, Cap Rep (2023).42(1):2

Carbon Dioxide Laser surgery for chronic proliferative otitis externa – an alternative to Total Ear Canal Ablation

Using a CO2 laser to remove hyperplastic tissue around the ear canal and vertical canal had a good outcome in 93% of affected ears although some needed a second surgery and/or long-term medical management. **Hyperplastic horizontal canals were not amenable to surgery** so were excluded from this protocol. The authors note less successful treatment options include ciclosporine, injected triamcinolone and traditional surgery.

Aslan, J. (2021). Vet Derm 32(3) 262-e72, Cap Rep (2023).42(1):2

Identifying Biofilm in canine otitis externa

Bacteria embedded in biofilms are more resistant to treatment so identifying biofilm is important. In this paper, researchers compared modified Wright's (Diff-Quik) to Periodic acid Schiff (PAS) stains to determine if biofilm could be identified in ear cytologies. Agreement was good with PAS and fair with Diff-Quik. Biofilm infection was likely

if 3 or more bacterial aggregates were present, if high-density material was present, and if staining of extracellular & matrix was seen. Finding clumps of bacteria in different focal planes in a background of matrix is suggestive of biofilm [[photo in Harvey, page 6](#)].

Parnell-Turner, H. (2021). Vet Derm 32(5):448-e122, Cap Rep (2023).42(1):2

ENDOCRINOLOGY

Cushings Disease – Diagnosis and Treatment

The authors do not test for Cushing's disease unless the dog is clinical; their index of suspicion increases if the patient has a high ALP, normal ALT, high cholesterol, increased platelets, decreased lymphocytes, mild hyperglycemia, proteinuria, and/or minimally concentrated urine. On imaging, signs suggesting Cushing's include adrenomegaly, an enlarged and hyperechoic liver, an increase in echogenic gallbladder material and/or a gallbladder mucocele.

One author prefers the Low Dose Dexamethasone Suppression Test (LDDST) for diagnosis of Cushing's. However, if the dog is highly likely to be Cushingoid or has concurrent disease such as diabetes or kidney failure, an ACTH stim is advised instead.

Interpreting the LDDST: **Cushing's is likely if the cortisol at 8 hours is <50% of baseline or <2 µg/dL, whichever is higher.** If the cortisol is also suppressed at 4 hours, the diagnosis is pituitary-dependent hyperadrenocorticism. If there is no suppression at 4 hours, then an abdominal ultrasound is the best test to differentiate pituitary from adrenal disease. However, if the client is not interested in pursuing surgery or does not care about prognosis, one may simply start treatment rather than perform additional diagnostics.

The survival for adrenal dependent Cushing's is about 1 year vs 2-3 years for pituitary dependent Cushing's. Untreated Cushing's disease can result in fatal thromboembolism due to hypercoagulability.

Start trilostane (Vetoryl) at ~1 mg/kg q12h. The post-ACTH cortisol should be between 2-5 µg/dL. If the cortisol is <2, decrease the dose. If the cortisol is >5 but the dog has **no** clinical signs, the authors may **not** increase the dose. **Baseline cortisol levels cannot substitute for an ACTH stim** as the values vary widely.

Other treatment options include ketoconazole (authors have not used) and mitotane (used if dog experiences GI signs with Vetoryl or if the less frequent dosing is required by the owner). If a dog has neuro signs or personality changes, a macroadenoma (vs microadenoma) may be present and radiation therapy should be considered.

Carter, TD. & Foy, D. VMX 2023: 257-259, Cap Rep (2023).42(1):2

GASTROENTEROLOGY

Conservative management of sharp foreign bodies in the stomach or intestines is feasible but endoscopic retrieval is indicated for pharyngeal & esophageal foreign bodies

In this small study of 17 cases (13 dogs & 4 cats), that had ingested sharp straight metallic objects (pins, nails and sewing needles (half with thread attached)) **88% passed the object(s) with conservative treatment only.** 2 of the

17 patients required surgery when the foreign body did not progress down the tract within 24 hours of admission. The authors opine that up to 72 hours may be a realistic timeframe based on human data and since the average GI transit time for these patients was 59 ± 31 hours.

Conservative management included at least daily ultrasound exams to check for peritoneal fluid, abdominal radiographs and monitoring for possible perforation (abdominal pain, vomiting, fever). Fluids, analgesia, and/or omeprazole were administered to a few patients. Conservatively managed patients averaged 48 hours of hospitalization vs 72 hours for the 2 treated surgically.

In this paper, cases involving the pharynx or esophagus were excluded since those should have the foreign body removed endoscopically. In previous veterinary studies, **the majority of foreign body perforations were located in the pharynx or esophagus with only about 8% occurring in the stomach or intestine.**

In **humans**, endoscopic removal of sharp foreign bodies in the esophagus or stomach is recommended since the risk of complications can be as high as 35%. However, once in the intestines, the foreign body should be monitored radiographically; surgery is indicated if the foreign body does not move within 72 hours.

[Crino, C. \(2023\). Journal of Small Animal Practice \(2023\); 64, 522–526](#)
[Cap Rep \(2023\).42\(1\):2-3](#)

NEPHROLOGY & UROLOGY

Urine culture and susceptibility indicated for feline bacterial cystitis; amoxicillin or SMZ-TMP advised as initial therapy

In this review of 363 urine cultures, **E. coli represented 52% of isolates and Enterococcus spp. 26%.** 20% of the cultures grew more than one bacterial isolate. 75% of bacteria were sensitive to SMZ-TMP, amoxicillin/clavulanic acid 72%, doxycycline 71%, ampicillin 62%, enrofloxacin 61%, marbofloxacin 59% cefazolin 49%, and pradofloxacin 41%. 19% of isolates were multi-drug resistant.

Recurrent bacterial cystitis is defined as 3 or more UTIs per year and sporadic bacterial cystitis is fewer than 3 per year. In this study, sporadic UTI occurred in 30% of cases and recurrent in 3.6%. **Subclinical bacteriuria (i.e., no clinical signs) occurred in 59% of cases.** Pyelonephritis occurred in 15.4% of patients. Kidney disease was a comorbidity in 37% of episodes, 12% had concurrent GI disease and 8% had lower urinary tract disease.

The authors conclude that **bacterial culture and susceptibility testing is necessary to treat cats with urinary tract infections since none of the antibiotics would reliably treat 90% of isolates.** On the other hand, **subclinical bacteriuria may not need treatment.** The International Society of Companion Animal Infectious Disease (ISCAID) guidelines **do not recommend amoxicillin/clavulanic acid** as an initial treatment for UTI. In this analysis, an increase in resistance to amoxi/clav was noted. Instead, **ISCAID guidelines suggest amoxicillin or SMZ-TMP as first choices.** Although chloramphenicol (86%) and imipenem (88%) had the highest susceptibilities, these antibiotics are reserved for life-threatening infections.

[Koontz, C. W. \(2023\). JVIM 37:1077-1087](#)

[Cap Rep \(2023\).42\(1\):3](#)

NURSING

Handling Fractious Cats

Watch 1) a 2-minute [video with Dr. Sophia Yin](#) on how to examine a feral cat using a towel to get the cat out of the carrier, 2) a 43-second [video](#) on how to correctly contain a loose cat, 3) an hour long [video](#) on demand with Dr. Yin demonstrating 6 towel wrap techniques (\$19.95 to rent, \$39.95 to buy/stream), and 4) print a pdf of "[How to Make a Kitty Burrito](#)"

[Cap Rep \(2023\).42\(1\):3](#)

ONCOLOGY – CRITICAL CARE – SPLENIC MASSES & HEMOABDOMEN

Approximately 72% of splenic masses are benign

According to research conducted in the Republic of Korea, of 137 canine splenic masses, only 26% were malignant (10% hemangiosarcoma, 8% lymphoma 7% sarcoma, and 1% other cancers) while 48% were nodular hyperplasia and 24% hematomas. This finding is significantly different from the “double two-thirds” rule that 2/3 of splenic masses are malignant and 2/3 of those are hemangiosarcoma (~45% of total).

[Ko, YU. \(2023\). Vet. Sci. 2023,10, 247, Cap Rep \(2023\).42\(1\):3](#)

Hemoabdomen carries a worse prognosis

In a “[mini meta-analysis](#)” of 8 studies involving 1637 splenic masses, **53% were malignant** and 33% of all cases were hemangiosarcoma. This contrasts with a review of 14 studies involving 1150 dogs with **hemoabdomen** in which **73% were malignant** and 64% of the bleeds were due to hemangiosarcoma.

[Schick,AR & Grimes, JA. \(2023\). JAVMA 261\(1\):69-73](#)
[Cap Rep \(2023\).42\(1\):3](#)

In another study, 17% of dogs with hemoabdomen due to a **benign** mass, had a median survival time (MST) of 49 days after splenectomy. The MST of ruptured hemangiosarcomas range from 19 to 86 days, even with chemotherapy. Negative prognosticators included increased volume of abdominal blood (ml/kg), decreasing platelet count, finding a hepatic mass, and lack of preoperative imaging.

[Millar, SL. \(2022\). JAVMA 260\(S1\):S9-14](#)
[Cap Rep \(2023\).42\(1\):3](#)

Small-breed dogs who present with hemoperitoneum are **2.6 times** more likely to have a diagnosis of a malignant splenic lesion.

[Fernandez, S. \(2019\). JAAHA \(2019\) 55 \(4\): 201–209](#)
[Cap Rep \(2023\).42\(1\):3](#)

25% of Owners second-guess their decision, Median Survival Times & Costs

In research done at Cornell, the source of hemoabdomen in 132 dogs was suspected to be spleen in 66%, liver in 30% and other in 4%, based on ultrasound. 31% of dogs were euthanized shortly after diagnosis. Of the 40 dogs who underwent surgery, **the median survival time was 213 days vs those treated with palliative care of 39 days. If the mass was malignant, MST was 81 days even with surgery.** However, the owner-reported Quality of Life was better for dogs treated surgically than palliatively, even if the pet had malignant disease. No matter whether the owner elected euthanasia, surgery or palliative care, about

25% of owners second-guessed their decision. In this analysis, an **elevated lactate** preoperatively did **not** have prognostic value. The median cost of the initial emergency visit was \$1324, and the median cost of surgery was \$4641 at Cornell University.

Menard, JV. (2023) JAVMA 261(7):980-988
Cap Rep (2023).42(1):3-4

Tufts Splenic Tumor Assessment Tool

Tufts Splenic Tumor Assessment Tool calculates the probability of splenic neoplasia based on total protein, abdominal effusion, number of liver, mesenteric and omental nodules, number and size of splenic masses, and number of NRBCs ($\geq 2/100$ WBCs increases likelihood of neoplasia). <http://t-stat.org/> *Cap Rep (2023).42(1):4*

Interesting correlation between size of splenic nodules and probable malignancy

“Our results indicated that very small splenic nodules were commonly benign and the probability of malignancy increased as mass diameter approached about 7 cm; when the largest diameter of the splenic mass (or largest splenic mass in patients with > 1 observed) exceeded 7 cm, masses of increasing size were progressively less likely to be malignant. We considered it possible that the **7-cm cutpoint** may have represented an approximate size by which most hemangiosarcomas have ruptured or are at imminent risk of rupturing.”

Burgess, KE. (2021). JAVMA 258(12):1362-1371
Cap Rep (2023).42(1):4

Rule of Thumb based on literature review

If the dog presents **with hemoabdomen**, there is about 3/4 (73%) chance it is due to a malignant process and 2/3 chance it is due to hemangiosarcoma. If the dog has a splenic mass **without** bleeding, there is about 50% chance that it is malignant and 1/3 chance it is due to hemangiosarcoma. – ed

Mini Meta-Analysis
Schick, AR & Grimes, JA. (2023). JAVMA 261(1):69-73
Cap Rep (2023).42(1):4

PROCEDURES & TECHNIQUES

Urethral catheterization of female cats and small dogs using a 2-catheter technique

[A 2:27 minute video demonstrates the technique.](#) It is typically used in animals less than 22 pounds. The patient is placed in sternal recumbency with a towel underneath to tilt the pelvis up; pass a red rubber catheter into the vaginal canal until it hits the cervix; then pass the urethral catheter below the large catheter and direct it ventrally into the urethra.

	Vaginal catheter	Urethral catheter
Dog	18F	8F
Cat	10F	5F

Dornbusch, JA. (2023). JAVMA 261(8). Cap Rep (2023).42(1):4

TOXICOLOGY – NEW PRODUCTS

Ropinirole (Clevor) eye drops to induce emesis – a substitute for apomorphine

Ropinirole (Clevor) eye drops result in emesis with a median time of 11 minutes (compared to topical apomorphine of 6-18.6 minutes and IV apomorphine of 1 minute). In this experiment the first dose of Clevor resulted

in 79% of the dogs vomiting whereas the second dose increased emesis to 91%. The authors allowed 15-20 minutes for emesis before administering a second dose (the product insert states 20 minutes). Personnel should wear gloves and eye protection during administration. The authors suggest dispensing Clevor to clients whose dogs repeatedly ingest foreign material.

Ropinirole is a synthetic derivative of morphine and non-selective dopamine agonist that stimulates the chemoreceptor trigger zone. It is highly selective for the dopamine D2-like receptors but not the D1 and does not have any opioid receptor activity. **Metoclopramide reverses the D2 receptor sites and is administered at 0.5 mg/kg IV or SC if needed for persistent vomiting.** Ropinirole is eliminated primarily by hepatic metabolism. The most common adverse reactions are eye irritation (51%), mild lethargy (41%) and increased heart rate (14%); adverse effects should resolve within 6 hours.

Clevor is FDA approved for induction of vomiting in dogs and **is not controlled**. It is sold as 5 droppers per package; one distributor sells a box for about \$118. Each dropper is 0.3 ml of 30 mg/ml ropinirole; each drop is 810 mcg with the target dose being 3.75 mg/m² (range 2.7-5.4 mg/m²). The shelf life is 2 years but once opened it should be discarded after 30 minutes. A dosing chart is in the [product insert](#).
Rosenstein, N.A., et al. (2023) JAVMA 261(8):1140-1146
Cap Rep (2023).42(1):4

AVIAN/EXOTIC

Use of an osmotic pump for drug delivery

A capsule-sized osmotic pump (0.1 µl/hr) filled with 0.2 ml of meloxicam (40 mg/ml) maintained levels of meloxicam similar to 2 mg/kg q12h oral dosing from 12 hours to 6 days after surgical implantation in pigeons. The authors advise giving an oral dose of meloxicam at the time of surgery to provide analgesia until the pump reaches an analgesic meloxicam concentration at about 12 hours. The pump used in this investigation was an Alzet 2001; the company website is <https://www.alzet.com/> and their [price list is here](#); the cost of this pump was \$32.50, and is only sold in multiples of 10. The company states, “the ALZET pumps are not approved for veterinary use.”

Coutant, T. (2023). AJVR 84(4) Cap Rep (2023).42(1):4

REPTILES

Use of alfaxalone in bearded dragons

10 mg/kg alfaxalone IM into the triceps or quadriceps muscle resulted in loss of righting in about 8 minutes (range 4-12) and recovery in 64-80 minutes (range 44-112). The elimination half-life was 72 minutes.

Shippy, S. (2023). Vet Anaesthesia & Analgesia 50(3):280-288
Cap Rep (2023).42(1):4

SMALL MAMMALS

Gabapentin for stress reduction in rabbits

In this study, 8 young rabbits showed reduced stress responses 2 hours after receiving 25 mg/kg gabapentin PO. NB: Carpenter (2023) p 587, dose is 3-5 mg/kg PO q12-24h or 25 mg/kg SC. *Conway, R.E. (2023). Topics in Companion Animal Med 53-54*
Cap Rep (2023).42(1):4