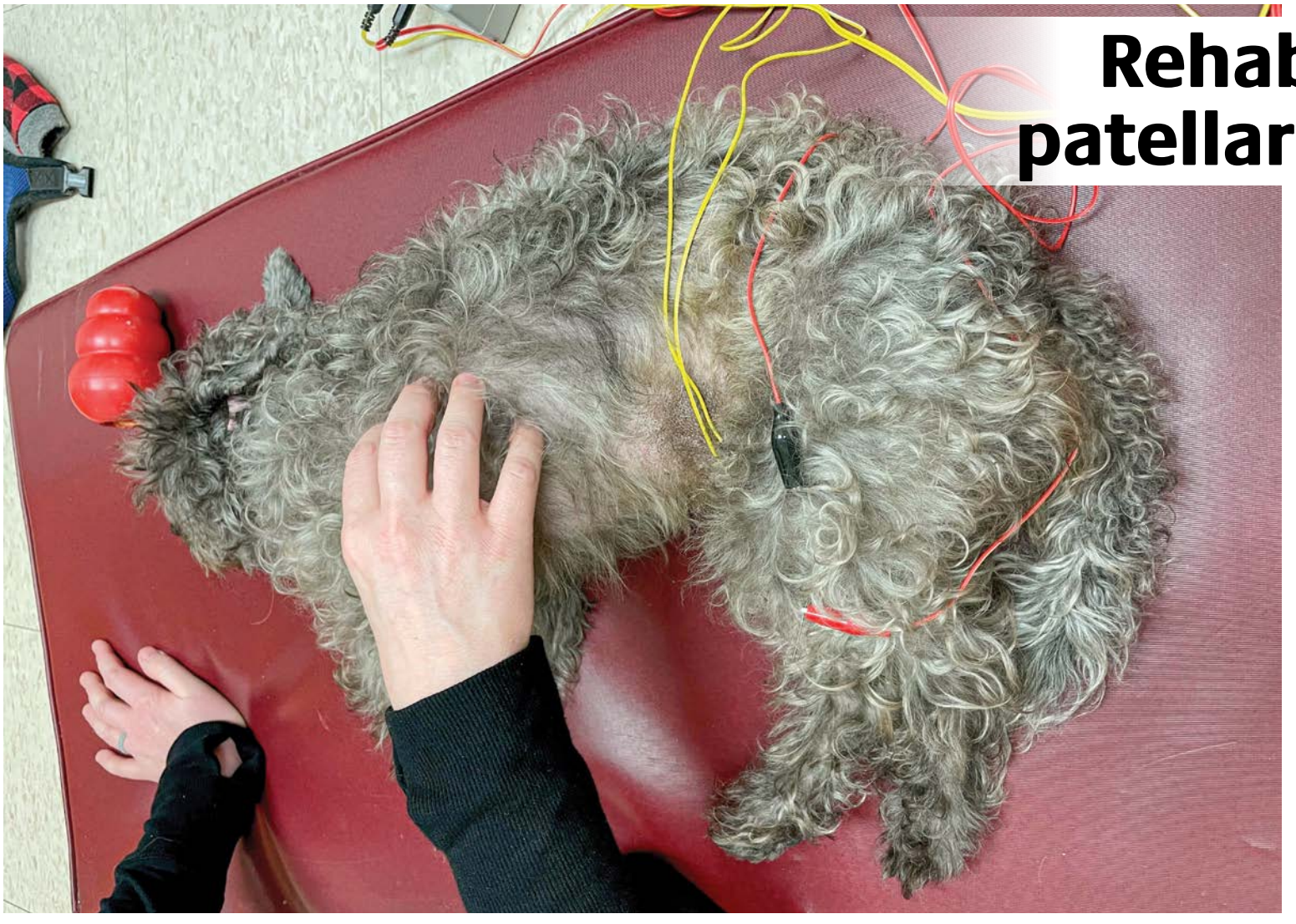
PHOTOS COURTESY DR. ADRIANNA M. SAGE

Rehab first for patellar luxation



Bindo, a small mixed-breed dog, receives electroacupuncture to the left hind limb for medial patellar luxation.



Adrianna M. Sage, DVM, MS, cVMA, DACVAA, applies electroacupuncture to Bindo's medial pelvic limb to address myofascial restriction that is inciting the luxation.



Hind limb problems can result in tension in the neck and shoulders. Here, Bindo receives dry needling along the caudal back and hips for secondary myofascial strain.



evidence-based MEDICINE

Narda G. Robinson, DO, DVM, MS, FAAMA

With all the strides integrative rehabilitation and physical medicine (IRPM) have made over the past two decades, why does offering that instead of surgery for orthopedic problems continue to seem so "radical"?

Especially for conditions that do not constitute orthopedic emergencies, animals have time to wait and begin a round or two of rehabilitation first. The often-touted argument, without surgery, dogs with cranial cruciate ligament disease will develop more arthritis than with it lacks evidential justification. Given the breadth of modalities that IRPM encompasses, it behooves veterinary practitioners to provide clients with a full complement of options, surgical and non-surgical, and risks and benefits for each pathway, well before making that first cut.

Patellar luxation (PL) is not an emergency, either. In fact, for many of these dogs, the problem is not just the patella and the groove in which it travels. PL results from an imbalance of soft-tissue forces and, often, a deficit in intrinsic support.

However, the issue may have started elsewhere, such as the hip. If we analyze the anatomic connections to the patella and their fascial extensions, it becomes clear deepening the trochlear groove and fastening down fascia targets only a part of the problem. To fully comprehend the underlying causes and subsequent consequences, we must examine the entire dog.

A luxating patella causes pain, anxiety, weight shifts, myofascial strain, and various patterns of tension throughout the body. In short, there's a lot we need to unpack and undo.

Nonsurgical treatment

"Conservative" management, now broadened into full-spectrum IRPM methodology, comprises far more than it used to, when it consisted merely of NSAIDs, a few therapeutic exercises, weight control, and massage.

Modern-day modalities include acupuncture, electrotherapy, shockwave therapy, pulsed electromagnetic field therapy, kinesiology taping, underwater treadmill, medical massage, fascial release, trigger point therapy, stretching, cannabinoids, injectable agents, thermal treatments, and more.

Why haven't we heard more about IRPM for PL? In this author's opinion, veterinary medicine, especially as taught in many veterinary colleges, contains an intrinsic bias toward surgery. Students learn about PL mostly during orthopedic surgery classes and rotations. Their orthopedic surgery instructors may be more likely to encourage surgery first rather than IRPM because they are more familiar with the former. Some may have little to no knowledge of current rehab techniques or even have a bias

against them. It may, therefore, be inconceivable to them that non-surgical treatment could be successful, scientific, or in any way superior to surgical techniques.

Not all dogs get sent for surgery, at least not right away.

According to one group of authors, "Surgical treatments are recommended for dogs with an intermittent or permanent lameness as a result of patellar luxation or in young dogs in an attempt to mitigate the negative effects of the condition on growing bone." They continue: "Joint pathology increases with age and luxation grade, and surgical correction should be performed at the earliest opportunity to limit further development of skeletal abnormalities of DJD."[1]

With this extensive range of inclusion criteria, who does it leave out? Pretty much no one. Even the lowest-grade dogs will usually show intermittent lameness.

Risks and complications of surgery

The risks and complications from surgical correction of PL range from the more common (post-surgical pain, infection, bleeding, and adverse reactions to anesthesia) to the less frequent (implant failure, persistent lameness, arthritis, and reduced range of motion of the stifle). Even after surgery, PL may recur, especially for dogs with higher-grade luxation.

Out of 24 dogs and 29 stifle joints in dogs that underwent surgical correction of grade IV medial PL, "24 percent of stifle joints had major complications, and 21 percent of joints required surgical revision. Grade II to IC recurrence of MPL was identified in 21 percent of stifle joints. One dog had a catastrophic complication requiring limb amputation."[2]

Another group noted, "The overall complication rate following stabilization of unilateral patellar luxation has been reported as 13 to 45 percent, including all the surgical correction(s) for different medial patellar luxation grades."[3]

Dogs are never the same after surgery. Severing skin, muscle, fascia, and bone permanently disrupts bodily integrity, as well as the fascial support mechanisms and force vectors. In comparison, IRPM works to restore bodily function to a better working state by changing muscle tone, releasing fascial restrictions, improving neural communication, and facilitating the healthful flow of blood and lymph.

How is IRPM different?

The risks of IRPM are minimal compared to surgery. IRPM is also more cost-effective than surgery, especially when factoring in pre-operative laboratory tests, hospitalization, and possible post-surgical care procedures or additional surgery to address complications that may arise.

Nonsurgical management causes less stress and allows dogs to remain in familiar surroundings without hospitalization. While some clinic visits may be necessary for modalities such as underwater treadmill therapy, extracorporeal shockwave therapy, and medical acupuncture, clients can work on prescribed therapeutic exercises directly with their dog and even perform gentle massage, stretching, and photomedicine.

When assembling an IRPM treatment plan, we tackle the same issues surgeons do. To wit, "Reconstructions are usually performed to release tight tissues and tighten loose tissues."[4] IRPM seeks to do the same, but from a physiologic approach (*e.g.* mobilizing fascia, relaxing muscles, and modulating nervous system activity).

In contrast, soft tissue surgical procedures for medial patellar luxation include "medial desmotomy, lateral imbrication, antirotational sutures, and release of medial musculature."[5] "Medial desmotomy refers to a releasing incision in the soft tissues on the medial side of the joint, including the medial retinaculum and joint capsule. Desmotomy allows (the) release of contracted tissues that prevent the patella from returning to the trochlear groove. The releasing incision, including the joint capsulotomy, (is) left open. Leakage of synovial fluid is not a problem."[6] "Lateral imbrication goes hand in hand with desmotomy in most cases, as it involves the use of "gathering sutures" to tighten up soft tissues contralateral to the luxation."[7] "Antirotational sutures are similar to the extracapsular sutures used for repair of the cranial cruciate ligament."[8] "Muscle release procedures can be accomplished in a variety of ways. The rectus femoris muscle can be dissected away from the joint capsule and the adjacent femur and musculature as an extension of the medial desmotomy. Freeing the rectus femoris muscle, at least to the level of the middle of the femur, may relieve significant medially directed tension on the patella."[9]

A closer look at both options

Even without considering the impact of invasive maneuvers, such as tibial tuberosity transposition, trochlear groove deepening, and corrective osteotomies, we can appreciate the obvious philosophical differences between surgery and IRPM. This dichotomy harkens back to the carpenter-and-gardener metaphor. Whereas the carpenter seeks to achieve a specific outcome by following a predetermined plan, the gardener cultivates a nurturing environment that allows natural processes to foster recovery.

Similarly, the gardener-style approach to PL would match mechanisms of dysfunction, pain, and mobility impairment with the mechanisms of healing that an IRPM modality stimulates. Often, multiple modalities have overlapping mechanisms; this gives us flexibility to introduce therapies that work best for this individual dog, cared for by this particular client, and is what this individual clinician deems needed in this instance.

First let's look at the tracking problem itself. In dogs with medial luxating patella, as mentioned, some tissues become too loose, while others become too tight. Utilizing myofascial palpation, a clinician may find hypertonicity and shortening of muscles on the medial aspect of the pelvic limb, most notably the vastus medialis and sartorius. If so, several treatment methods may help to reduce that tension, including medical acupuncture, massage, photomedicine, and stretching.

We may also question why medial hypertonicity exists in the first place and subsequently proceed to assess the integrity of the coxofemoral joints.

Dogs with ligamentous laxity and hypermobility of these joints may compensate for the weakness in their stance by overrecruiting muscles of the medial thigh. This, then, may cause chronic pulls on the patella toward the midline, accentuated by concomitant restriction in the fascial entities that course through that region. Thus, a

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luxating patella may be corrected by first addressing weakness in the hips and pelvis.

For hip strengthening, one might begin by applying kinesiology tape to the gluteal muscles to build kinesthetic awareness of them as the dog walks.

In addition, a therapist may repeatedly tap, massage, or electrically activate the gluteal muscles while the dog is standing, shifting the weight back and forth to further enhance proprioception. Soft tissue therapy (myofascial release, massage, and stretching) may be performed to restore length to the restricted myologic and fascial entities, including those mentioned above, along with the iliopsoas muscle complex.

Final thoughts

In summary, each dog's rehab plan will take into account the type, severity, and location of pain, as well as inflammation edema, acute injury or chronic changes, range of motion indicating hyper- or hypomobility, neuromotor patterning, and comorbidities.

Structurally, the veterinarian would assess posture and spinal mobility, relative tone and bulk of muscles in all four limbs, neurologic status, and myofascial strain patterns from nose to tail and topline to toe. We would ask how much exercise the dog gets and what is expected of them. We need to limit running, jumping, stair climbing, and activities that require rapid changes in direction.

Swimming or underwater treadmill exercises may play a huge role in the dog's recovery, and throughout it all, communication remains open between client and clinician so the capacities as well as the limitations of their own abilities are considered along with those of the dog.

IRPM does not mean surgery is out of the question; it should just not be the first and only option clients hear.

Narda G. Robinson, *DO, DVM, MS, FAAMA, practices osteopathic medicine and veterinary medicine. Dr. Robinson taught science-based integrative medicine at the Colorado State University College of Veterinary Medicine and Biomedical Sciences for 20 years. In 2016, Robinson established her academy in Fort Collins, Colo., where she teaches medical acupuncture, integrative rehabilitation, medical massage, and other integrative medical approaches. Dr. Robinson is now offering programs in Sidney, British Columbia. Columnists' opinions do not necessarily reflect those of* Veterinary Practice News.

References
Scan the QR code to view references for this article.

Klentz™
(florfenicol, terbinafine, mometasone furoate)
Otic Solution for use in dogs only

Antibacterial, antifungal, and anti-inflammatory
Do Not Use in Cats.

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

DESCRIPTION:
Klentz contains 16.6 mg/mL florfenicol, 14.8 mg/mL terbinafine (equivalent to 16.6 mg/mL terbinafine hydrochloride) and 2.2 mg/mL mometasone furoate. Inactive ingredients include purified water, propylene carbonate, propylene glycol, ethyl alcohol, and polyethylene glycol.

INDICATIONS:
Klentz is indicated for the treatment of otitis externa in dogs associated with susceptible strains of yeast (*Malassezia pachydermatis*) and bacteria (*Staphylococcus pseudintermedius*).

DOSAGE AND ADMINISTRATION:
Klentz should be administered by veterinary personnel.

Wear eye protection when administering Klentz. (see **Human Warnings, Precautions, Post-Approval Experience**).



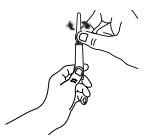
Splatter may occur if the dog shakes its head following administration. Persons near the dog during administration should also take steps to avoid ocular exposure.

Shake before use.

Verify the tympanic membrane is intact prior to administration. (see **Contraindications, Precautions, Post-Approval Experience**).

Administer one dose (1 dropperette) per affected ear.

1. Clean and dry the external ear canal before administering the product.
2. Verify the tympanic membrane is intact prior to administration.
3. Remove single dose dropperette from the package.
4. While holding the dropperette in an upright position, twist the cap to open the dropperette. The cap does not come off the dropperette.



5. Insert the tapered tip of the dropperette into the affected external ear canal and squeeze to instill the entire contents (1 mL) into the affected ear.
6. Gently massage the base of the ear to allow distribution of the solution. **Restrain the dog to minimize post application head shaking** to reduce potential for splatter of product and accidental eye exposure in people and dogs (see **Post-Approval Experience**).



7. Repeat with other ear as prescribed.
8. The duration of the effect should last 30 days. Cleaning the ear after dosing may affect product effectiveness.

CONTRAINDICATIONS:
Do not use in dogs with known tympanic membrane perforation (see **Precautions**).

Klentz is contraindicated in dogs with known or suspected hypersensitivity to florfenicol, terbinafine hydrochloride, or mometasone furoate.

WARNINGS:
Human Warnings: **Klentz may cause eye injury and irritation** (see **Precautions, Post-Approval Experience**).

If contact with eyes occurs, flush copiously with water for at least 15 minutes. If irritation persists, contact a physician.

Humans with known hypersensitivity to any of the active ingredients in Klentz should not handle this product.

Not for use in humans. Keep this and all drugs out of reach of children. Avoid skin contact. In case of accidental ingestion by humans, contact a physician immediately.

PRECAUTIONS:
For use in dogs only. Do not use in cats (see **Post-Approval Experience**).

Wear eye protection when administering Klentz and restrain the dog to minimize post application head shaking. Reducing the potential for splatter of product will help prevent accidental eye exposure in people and dogs and help to prevent ocular injury (see **Dosage and Administration, Human Warnings, Post-Approval Experience**).

Proper patient selection is important when considering the benefits and risks of using Klentz. The integrity of the tympanic membrane should be confirmed before administering the product.

Florfenicol, terbinafine, and mometasone furoate otic solution has been associated with rupture of the tympanic membrane. Reevaluate the dog if hearing loss or signs of vestibular dysfunction are observed during treatment.

Signs of internal ear disease such as head tilt, vestibular signs, ataxia, nystagmus, facial paralysis, and keratoconjunctivitis sicca have been reported (see **Post-Approval Experience**) with the use of florfenicol, terbinafine, and mometasone furoate otic solution.

Do not administer orally.

Use of topical otic corticosteroids has been associated with adrenocortical suppression and iatrogenic hyperadrenocorticism in dogs (see **Animal Safety**).

Use with caution in dogs with impaired hepatic function (see **Animal Safety**).

The safe use of Klentz in dogs used for breeding purposes, during pregnancy, or in lactating bitches, has not been evaluated.

ADVERSE REACTIONS:
In a field study conducted in the United States (see **Effectiveness**), there were no directly attributable adverse reactions in 146 dogs administered florfenicol, terbinafine, and mometasone furoate otic solution.

POST-APPROVAL EXPERIENCE (2019):
The following adverse events are based on post-approval adverse drug experience reporting for florfenicol, terbinafine, and mometasone furoate otic solution. Not all adverse events are reported to FDA/CVM. It is not always possible to reliably estimate the adverse event frequency or establish a causal relationship to product exposure using these data.

In **humans**, accidental exposure leading to corneal ulcers and other ocular injuries such as eye irritation and redness have been reported. Exposure occurred when the dog shook its head after application of florfenicol, terbinafine, and mometasone furoate otic solution.

Skin irritation has also been reported.

In **dogs**, the adverse events reported are presented below in decreasing order of reporting frequency:

Ear discharge, head shaking, ataxia, internal ear disorder (head tilt and vestibular), deafness, emesis, nystagmus, pinnal irritation and ear pain, keratoconjunctivitis sicca, vocalization, corneal ulcer, cranial nerve disorder (facial paralysis), tympanic membrane rupture.

Klentz (florfenicol, terbinafine, mometasone furoate) otic solution is not approved for use in **cats**. The adverse events reported following extra-label use in **cats** are presented below in decreasing order of reporting frequency:

Ataxia, anorexia, internal ear disorder (head tilt and vestibular), Horner's syndrome (third eyelid prolapse and miosis), nystagmus, lethargy, anisocoria, head shake, emesis, tympanic rupture, and deafness.

CONTACT INFORMATION:
To report suspected adverse drug experiences, for technical assistance, or to obtain a copy of the Safety Data Sheet (SDS), contact Aurora Pharmaceutical at 1-888-215-1256.

For additional information about reporting adverse drug experiences for animal drugs, contact FDA at 1-888-FDA-VETS or http://www.fda.gov/reportanimalae

Information for Dog Owners:
Owners should be aware that adverse reactions may occur following administration of Klentz and should be instructed to observe the dog for signs such as ear pain and irritation, vomiting, head shaking, head tilt, incoordination, eye pain and ocular discharge (see **Post-Approval Experience**). Owners should be advised to contact their veterinarian if any of the above signs are observed.

Owners should also be informed that splatter may occur if the dog shakes its head following administration of Klentz which may lead to ocular exposure. Eye injuries, including corneal ulcers, have been reported in humans and dogs associated with head shaking and splatter following administration. Owners should be careful to avoid ocular exposure (see **Precautions, Post-Approval Experience**).

PHARMACOLOGY:
Klentz otic solution is a fixed combination of three active substances: florfenicol (antibacterial), terbinafine (antifungal), and mometasone furoate (steroidal anti-inflammatory). Florfenicol is a bacteriostatic antibiotic which acts by inhibiting protein synthesis. Terbinafine is an antifungal which selectively inhibits the early synthesis of ergosterol. Mometasone furoate is a glucocorticosteroid with anti-inflammatory activity.

MICROBIOLOGY:
The compatibility and additive effect of each of the components in florfenicol, terbinafine, and mometasone furoate otic solution was demonstrated in a component effectiveness and non-interference study. An *in vitro* study of organisms collected from clinical cases of otitis externa in dogs enrolled in the clinical effectiveness study determined that florfenicol and terbinafine hydrochloride inhibit the growth of bacteria and yeast commonly associated with otitis externa in dogs. No consistent synergistic or antagonistic effect of the two antimicrobials was demonstrated. The addition of mometasone furoate to the combination did not impair antimicrobial activity to any clinically significant extent. In a field study (see **Effectiveness**), at least 10 isolates from successfully treated cases were obtained for *S. pseudintermedius* and *M. pachydermatis*.

EFFECTIVENESS:
In a well-controlled, double-masked field study, florfenicol, terbinafine, and mometasone furoate otic solution was evaluated against a vehicle control in 221 dogs with otitis externa. One hundred and forty six dogs were treated with florfenicol, terbinafine, and mometasone furoate otic solution and 75 dogs were treated with the vehicle control. All dogs were evaluated for safety. Treatment (1 mL) was administered once on Day 0 to the affected ear(s). Prior to treatment, the ear(s) was cleaned with saline. The dogs were evaluated on Days 0, 7, 14, and 30. Blood work and urinalysis were obtained on Day 0 pre-treatment and Day 30 at study completion. Four clinical signs associated with otitis externa were evaluated: erythema, exudate, swelling, and ulceration. Success was based on clinical improvement at Day 30. Of the 183 dogs included in the effectiveness evaluation, 72.5% of dogs administered florfenicol, terbinafine, and mometasone furoate otic solution were successfully treated, compared to 11.1% of the dogs in the vehicle-control group ($p = 0.0001$).

ANIMAL SAFETY:
In a target animal safety study, florfenicol, terbinafine, and mometasone furoate otic solution was administered aurally to 12-week-old Beagle puppies (4 dogs/sex/group) at 0X, 1X, 3X, and 5X the recommended dose once every 2 weeks for a total dosing period of 28 days (3 times the treatment duration). No clinically relevant treatment-related findings were noted in hearing tests, body weight, weight gain, or food consumption. Florfenicol, terbinafine, and mometasone furoate otic solution administration was associated with post-treatment ear wetness or clear aural exudate, increased absolute neutrophil count, decreased absolute lymphocyte and eosinophil counts, suppression of the adrenal cortical response to ACTH-stimulation, decreased adrenal weight and atrophy of the adrenal cortex, increased liver weight with hepatocellular enlargement/cytoplasmic change, and decreased thymus weight. Other potentially treatment-related effects included mild changes to AST, total protein, inorganic phosphorus, creatinine, and calcium.

STORAGE INFORMATION:
Store up to 25°C (77°F), excursions are permitted up to 30°C (86°F).

HOW SUPPLIED:
Klentz solution is supplied in a single-use dropperette in a blister.

Each dropperette contains one 1 mL dose.

Klentz is available in cartons of two, twelve, or twenty-four dropperettes.

Manufactured by:
Aurora Pharmaceutical, Inc.
Northfield, MN 55057
1-888-215-1256 www.aurorapharmaceutical.com

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