

EXOTIC



DVM
VOLUME 9
ISSUE 3

Intraoral
Radiographic
Technique
in Rabbits

Reptile Lighting

EXOTICOS VET

\$20.00 (US)



Endless good reasons for recommending ZuPreem® exotic animal diets.

There's a ZuPreem® Diet formulated to meet the exact nutritional needs of many exotic animals you treat in your practice. Trusted by veterinarians for more than 40 years to provide a lifetime of quality nutrition for exotic animal pets. Call your veterinary distributor today to order ZuPreem products.

ZuPreem.com • 1-800-345-4767

ZuPreem is a trademark of Premium Nutritional Products, Inc. © 2005 Premium Nutritional Products, Inc.

ZuPreem®

Trusted for Life.™

contents



11

Sergio Sarmiento Valiente, DVM



15

Ariana Finkelstein, DVM



29

Frances Baines, MRCVS



37

Nimal Fernando, BSc, BVSc (Hon), MACVSc

Observations from the Field

- 7 Corneal Injuries in Chinchillas** - Prof. Corinna Eule, DVM, Dipl ECVO and Jan Gisle Sjøberg, DVM

TIPS & TRICKS

- 9 Alternative Method for Cable Tie Shell Repair in Chelonia** - Christopher Lloyd, BVSc, MSc, CertZooMed, MRCVS
- 11 Bone Pin Staples for Tortoise Shell Repair** - Sergio Sarmiento Valiente, DVM
- 12 Evaluating Birds' Feet Through Glass** - Greg J. Harrison, DVM, Dipl Emeritus ABVP - Avian Practice
- 13 Use of a Prosthesis for Severe Carapace Defects** - Sergio Sarmiento Valiente, DVM
- 14 Technique for Intubating Rabbits** - Susan Kelleher, DVM







Case Reports Peer Reviewed

- 15 Testicular Interstitial Cell Neoplasia in a Rabbit** - Ariana Finkelstein, DVM and Lynne Cassone, DVM
- 17 Penile Amputation and Urethrostomy in a Rat** - Véronique Mentré, DVM

Clinician's Notebook Peer Reviewed

- 21 Intraoral Radiographic Technique in Lagomorphs and Rodents** - Estella Böhmer, Dr med vet
- 29 Reptile Lighting is a Process Not a Bulb** - Henry Brames, Dr met vet and Frances Baines, MRCVS
- 37 How to Make a Fish Anesthetic Machine with Divided Recirculation Circuits** - Nimal Fernando, BSc, BVSc (Hon), MACVSc (Diagnostic Imaging, Avian Health); Walter Tang and Wendy Chan, RN

Departments

- 3**  Guest Editorial
- 5**  Exotic DVM of the Year
- 43**  Time Off
- 44**  For Your Bookshelf
- 47**  Exotic Marketplace
- 48**  Tools

EXOTIC **DVM**

A PRACTICAL RESOURCE FOR CLINICIANS

Supported in part by a grant from HBD International

Volume 9, Issue 3, October 2007

REVIEWERS

Experienced exotic animal practitioners who have reviewed articles written by their peers for Exotic DVM include:

Kay Backues, DVM

Kornelis Biron, Dr med vet

Heather Bowles, DVM, Dipl ABVP-Avian

Shane Boylan, DVM

Michael Cannon, BVSc, MACVSc,
Grad Dip Ed

Vittorio Capello, DVM

Brendan Carmel, BVSc, MVS,
GDipComp, MCP, MRCVS

Leigh Clayton, DVM, Dipl ABVP-Avian

Rob Coke, DVM

Graham Crawshaw, BVetMed, MRCVS,
Dipl ACZM

Lorenzo Crosta, DVM

Morgan Dawkins, DVM

Bob Doneley, BVSc, MACVSc
(Avian Health)

Thomas M. Donnelly, DVM, Dipl
ACLAM

Michael Dutton, DVM, Dipl ABVP-Avian

Kevin Eatwell, BVSc (Hons), DZooMed,
MRCVS, RCVS Certified in Zoological
Medicine

Christine Eckermann-Ross, DVM

Patty Ewing, DVM, MS, Dipl ACVP

Ariana Finkelstein, DVM

Peter Fisher, DVM

Rose Ann Fiskett, VMD, Dipl
ABVP-Avian

Craig A. Harms, DVM, PhD, Dipl ACZM

Greg Harrison, DVM, Dipl ABVP-Avian,
Dipl ECAMS

Heidi Hoefer, DVM, Dipl ABVP-Avian

Susan Horton, DVM

Stormy Hudelson, DVM, Dipl ABVP-
Avian

Cathy Johnson-Delaney, DVM,
Dipl ABVP-Avian

Dan Johnson, DVM

Jay Johnson, DVM

David Jones

Carla Kasaback, DVM

Susan Kelleher, DVM

Amy Kizer, DVM

Melissa Kling, DVM

David Knapp, DVM, Dipl ACVS

Jack Kottwitz, DVM

Marc Kramer, DVM

Daniel Lejnieks, DVM

Angela Lennox, DVM, Dipl ABVP-Avian

Bruce Levine, DVM, Dipl ABVP-Avian,
Canine & Feline

Gregory Lewbart, VMD, Dipl ACZM

Michael Lierz, Dr med vet

Fabiano Montiani-Ferreira, MV,
MCV, PhD

Neus Morera, DVM

Holly S. Mullen, DVM, Dipl ACVS

Michael Murray, DVM

Curt Nakamura, DVM

Connie Orcutt, DVM, Dipl ABVP-Avian

Lauren Powers, DVM, Dipl ABVP-Avian

Katrina Ramsell, PhD, DVM

Drury Reavill, DVM, Dipl ABVP-Avian,
Dipl ACVP

Helen Roberts, DVM

Dale Smith, DVM, DVSc

Michael Stanford, BVSc, FRCVS

W. Michael Taylor, DVM

W.H. Wildgoose, BVMS, CertFHP,
MRCVS

Frank J.M. Verstraete, Dr med vet,
BVSc(Hons), MMedVet, Dipl AVDC,
Dipl ECVS, Dipl EVDC

Kevin Wright, DVM

Donald Zantop, DVM, Dipl ABVP-Avian

Flavia Zorogniotti, DVM



Adding Convenience to Care

▲ Critical Care ▲ Carnivore Care ▲ FIBRevive

The OXProLine was developed by animal nutritionists and veterinarians and has been proven effective in restoring animal health.

The OXProLine features easy to use one-step powdered formulas, just add water.

- ▲ MWI Veterinary Supply - www.mwivet.com • 1-800-824-3703
- ▲ Midwest Veterinary Supply - www.midvet.com • 1-800-328-2975
- ▲ Webster Veterinary - www.webstervet.com • 1-800-225-7911



29012 Mill Road • Murdock, NE 68407 • 800-249-0366 • www.oxbowhay.com

COVER
Sergio Sarmiento Valiente, DVM

MEDICAL EDITOR

Melissa Kling, DVM

ADVISORY BOARD

Kornelis Biron, Dr med vet

Vittorio Capello, DVM

Brendan Carmel, BVSc, MVS, MRCVS

Leigh Clayton, DVM, Dipl ABVP-Avian

Rob Coke, DVM

Heidi Hoefer, DVM, Dipl ABVP-Avian

Dan Johnson, DVM

Marc Kramer, DVM

Angela Lennox, DVM, Dipl ABVP-Avian

Connie Orcutt, DVM, Dipl ABVP-Avian

Dale Smith, DVM, DVSc

Michael Stanford, BVSc, FRCVS

Lisa Tell, DVM, PhD, Dipl ABVP-Avian,
Dipl ACZM

Flavia Zorogniotti, DVM

EXOTIC DVM STAFF

Linda R. Harrison
Publisher

Richard Larson
Creative Director/Advertising

Dana O'Donoghue
Circulation

Mark Broughton
Order Fulfillment

Subscriptions 800-946-4782
561-641-6745
561-641-0234 Fax

Advertising 800-946-4782

Zoological Education Network is committed to increasing the competence and confidence of veterinary clinicians in working with exotic companion animals and raising the standards of care for these species.

EXOTIC DVM (ISSN:1521-1363) is published four times in 2007 by Zoological Education Network, 2324 S Congress Avenue, Suite 2A, West Palm Beach, FL 33406 (Phone 800-946-4782, 561-641-6745, Fax 561-641-0234). Annual subscription: \$69 US; \$89 international. Copyright 2007 by Zoological Education Network. All rights reserved. Periodical rates paid at West Palm Beach, FL and additional mailing offices. POSTMASTER: Send address changes to EXOTIC DVM, PO Box 541749, Lake Worth, FL 33454-1749.

© 2007 Zoological Education Network

Exotic Animal Practitioners: Healers, Nutritionists, Behaviorists and more



With Exotic DVM completing its 9th year, I continue to be astonished by the scope of information presented in each issue. It has been my privilege and honor to serve as guest medical editor, and I now have further appreciation of what is entailed in getting to press. Each article is an intricate progression between author, reviewer, publisher, editor and designer. All around the world, veterinarians are seeing unusual cases, encountering emerging diseases and attempting novel procedures—many of these yield remarkable results that need to be published.

The increase in knowledge of exotic animal medicine continues to transform at a phenomenal rate. As a 1983 graduate, I have had the good fortune to witness this changing and expanding growth. Because of this evolution, it has never been more imperative for exotic animal veterinarians to remain current and on the cutting edge of these developments. What we knew as recently as 3 years ago may very well be archaic in some areas. There are more opportunities than ever to learn through conferences, professional organizations, journals (both scientific and clinical), textbooks, professional online forums and the Internet. Collaboration among individuals in laboratory animal medicine, zoo/wildlife animal medicine and private exotic companion animal medicine has opened more avenues of information.

We are now being called upon to be healers, nutritionists, behaviorists and keepers. And these aspects alone can often be daunting due to the scope of species we encounter. We owe our patients a level of care and compassion not to be rivaled by other veterinary medicine disciplines. It has also become our task, quite by default, to provide the necessary education to the owners (and when required, as is so often the case, to pet stores/breeders) in order to enable these animals to live healthier and more enriched lives.

I would like to encourage our readers to form strong personal/professional contacts. Don't be reluctant to say, "I don't know" or to ask for help with tough cases. I myself could not afford the level of care I provide without deferring to several of my highly esteemed colleagues.

Passion, simply stated, is an intense, overwhelming conviction powered by boundless enthusiasm. One of my true passions is caring for these magnificent winged, furred, scaled (or other-skinned) creatures. My colleagues who are long time friends and even new acquaintances all have this "passion" in common—why else would we pursue such an unconventional path for our profession?

Melissa A. Kling, DVM, Macon, Georgia
Secretary, Association of Exotic Mammal Veterinarians

Soother Plus Cream— Not Just for the Birds Anymore



Now Available in Tubes!

www.AVI-x.com • www.HEAL-x.com
800-946-4782 • 561-641-6745
Contact us for veterinary pricing.

Greg Lewbart Named 2007 Exotic DVM of the Year

Gregory A. Lewbart, MS, VMD, Dipl ACZM, Professor of Aquatic Animal Medicine at North Carolina State University College of Veterinary Medicine, was recently acknowledged as the 2007 Exotic DVM of the Year. The award was presented during the AVMA Convention in Washington, DC by Dr. Helen Roberts, who represented Exotic DVM Veterinary Magazine. Dr. Lewbart was selected from a field of exotic animal veterinarians nominated by the readers of Exotic DVM.

The Exotic DVM of the Year Award is presented annually to an individual who embodies the essence of stewardship of exotic companion animal species, contributes to the education of veterinary students and clinicians, and serves as an international ambassador of good will for the exotic animal profession.

Dr. Lewbart received a BA in biology from Gettysburg College in 1981 and an MS degree in biology from Northeastern University in 1985. In 1988 he received his VMD degree from the University of Pennsylvania School of Veterinary Medicine. He joined the faculty at NCSU in 1993, where he currently teaches aquatic animal and herptile medicine.

He is an author on over 80 popular and scientific articles about invertebrates, fishes, amphibians and reptiles and speaks nationally and internationally on these subjects. He has also written 8 book chapters on pet fish disease and treatment and has edited a book about self-assessment clinical review of ornamental fishes. His most recent book, *Invertebrate Medicine*, received the Text and Academic Authors Association 2007 Textbook Excellence Award (College Life Sciences category).

Dr. Lewbart has also written



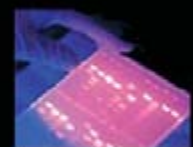


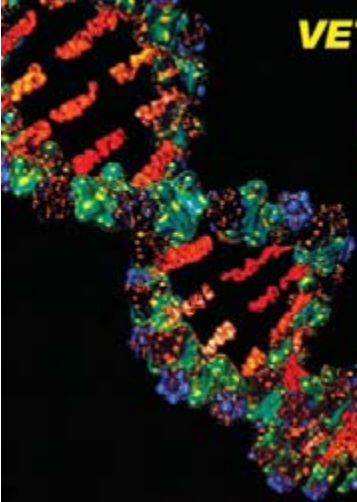
Dr. Greg Lewbart accepts his award. During an ICE wet lab, he demonstrates a koi anesthetic procedure to: (from left) Drs. Helen Roberts, Susan Kelleher and Scott Martin.



two novels, *Ivory Hunters* and *Pavilion Key*, published by Krieger Publishing, Florida. Both stories are scientific mysteries that raise important issues about wildlife conservation

and man's exploitation of the environment.

He and his wife, Diane Deresienski, also a veterinarian, live in downtown Raleigh with their assorted pets.



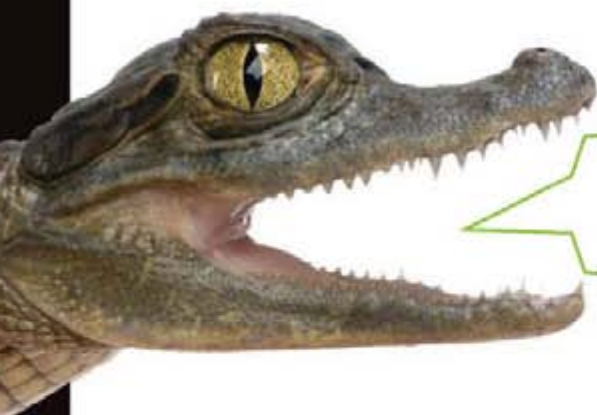
VETERINARY MOLECULAR DIAGNOSTICS, INC.

14 Years of Sensitive & Specific DNA
Testing for Veterinary Medicine

Circovirus (PBFD, All Pathotypes)
Psittacid Herpes Virus I (Genotypes 1-4)
Avian Polyomavirus
Avian Adenovirus
West Nile Virus
Avian Mycoplasma
Bordetella avium
Aspergillus fumigatus
Aspergillus genus
Mycobacterium genavense
Mycobacterium avium complex
Gender Assay (Blood, Feather, Oral Swab)

Ferret: *Helicobacter mustelae*
Campylobacter
Lawsonia intracellularis

Bob Dahlhausen DVM, MS - Pam VanOverloop BSc
5989 Meijer Dr., Suite 5, Milford, Ohio 45150
513.576.1808 fax: 513.576.6177
www.VMDLABS.com



The 2008 NAVC CONFERENCE

January 19-23, 2008

Your Source for Exotic Animal CE

Join your colleagues at the NAVC Conference in Orlando, FL for unparalleled exotic medicine lectures and laboratories. NAVC takes great pride in offering an educational format to fit any learning style and level of expertise. For exotic animal veterinarians and those with an interest in exotic animal medicine, the 2008 NAVC Conference will provide five exciting days of lectures, small interactive Masterclasses and hands-on laboratories. As a member of the veterinary healthcare team, the NAVC Conference offers you a unique learning experience in a relaxing environment, with nightly entertainment for all NAVC Conference registrants and their guests.



- Stay in one place: all exotic animal lectures and the exotic specialty exhibitors will be at the Marriott World Center hotel.
- 13 full-day, concurrent exotics sessions over five days: jump from room to room, hear the lectures you want to hear!
- Four hands-on laboratories: Avian Behavior, Chelonian (Turtle and Tortoise) Techniques, Small Mammal Emergency Techniques and Darting/Remote Injection Systems for Wildlife.
- Exotic animal lecture tracks: Aquatic Medicine, Avian Medicine, American Association of Zoo Veterinarians, Small Mammals, Reptiles - Lizards, Turtles & Tortoises and Snakes, Wildlife Medicine & Conservation and Zoonotic Disease in Exotics.
- General lecture tracks: Acupuncture, Anesthesiology, Animal CSI, Beef, Behavior Medicine, Cardiology, Dairy, Equine, Feline Medicine, Hospital Design, Nutrition, Pain Management, Practice Management, Senior Care, Shelter Medicine, Small Animal Dentistry, Swine, Wound Healing and many more!



Register Today!
Visit www.tnavc.org
or
Call (352) 375-5672
For More Information

NAVX EXOTIC ANIMAL SPEAKERS

Stephen L. Barten	Angela Lennox
Gregory Bossart	Marla Lichtenberger
Rob Coke	Doug Mader
John Cooper	Joerg Mayer
Mark W. Cunningham	Hayley Murphy
Orlando Diaz-Figueroa	Susan Orosz
Scott Echols	Helen Roberts
Gregory J. Fleming	Karen Rosenthal
Deldre Fontenot	Nico Schoemaker
Neil Forbes	Jonathan Sleeman
Stephen Hernandez-Divers	Stephen A. Smith
Charles Innis	Terry R. Spraker
Cathy Johnson-Delaney	Mark Stetter
Terry Kreeger	Laura Wade
Bill Lance	Kevin Wright





observations

F R O M T H E F I E L D

Because EXOTIC DVM Veterinary Magazine is a publication for international veterinary professionals, some of the information published may relate to drugs, products and procedures that may not be available or considered ethical/legal in some countries. EXOTIC DVM is a disseminator of information and has no opinion on the efficacy or legality of the drugs, products or procedures mentioned. It is the responsibility of the reader to consult regional and national veterinary and animal legislation in evaluating the use of this information.

Corneal Injuries in Chinchillas

Prof. **Corinna Eule**, DVM, Dipl ECVO, Freie Universität, Berlin, Germany and **Jan Gisle Sjøberg**, DVM, Emsalø, Finland



Fig. 1. a) Because chinchillas are prey animals, their eyes are positioned laterally on the head resulting in a wide field of vision; **b)** As crepuscular animals chinchillas have relatively large globes. The form of the pupil is vertical and slit-like, as in feline species, in order to protect the light-sensitive retina during daylight.³



Fig 2. To avoid scratches from dry fluorescein strips, the paper can be moistened with saline.

With their relatively large and protruding eyes, chinchillas are predisposed to corneal injuries (Figs 1a,b). One cause of these injuries may be the dust that is provided for their bathing.

Free-ranging chinchillas instinctively clean their fur by taking dust baths several times a week. Part of the recommendations for housing chinchillas in captivity is to provide containers of special chinchilla dust for bathing. This dust should be offered at least 3 times a week but be limited to a maximum of 5-10 minutes each session in order to prevent drying of the chinchilla's skin. In areas of high humidity dust baths may be offered more frequently. The use of inappropriate chinchilla dust, excessive bathing times or inadequate housing conditions may contribute to corneal lesions. Sand must be particularly avoided as a

bath substance. Particles made from sand have a rough, sharp-edged surface and can inflict injury. Quality chinchilla dust baths originate from coral algae granules, which have a smooth, round surface and are able to retain humidity.

The most common presenting clinical signs of corneal erosion include blepharospasm, epiphora and discharge from the injured eye. Differential diagnoses may include non-ulcerative keratitis (corneal dystrophy, mineralization, abscessation, scar tissue) or corneal ulcer (loss of stromal tissue, melting, non-melting, descemetocoele).

A thorough examination of the eye and its adnexa with a focal light source and magnification should be performed. Special attention should be paid to:

- integrity of the eyelids and their margins

- possible presence of a foreign body within the conjunctival cul-de-sac
- the corneal surface.

Testing the cornea with direct use of the dry fluorescein-impregnated paper strips may be challenging because the ocular surface can easily be scratched with the border of the paper. Therefore for small eyes, it is recommended to moisten the paper strip with 0.9% saline (Fig 2).

Because fluorescein is a hydrophilic chemical, it will not stain the intact lipophilic epithelium or Descemet's membrane. Only the hydrophilic stroma will absorb the dye. If a corneal injury is caused by inappropriate dust bath ingredients or extensive bathing, the lesion is typically superficial, clearly demarcated and scratch-like (Fig 3).

For the treatment of such corneal erosions and superficial ulcers, application of broad-spectrum



Fig 3. a) Chinchilla with a painful eye characterized by tearing and blepharospasm. Fluorescein has already been applied to the tear film; **b)** Close-up image of the painful eye: fluorescein-positive, scratch-like erosion of the corneal epithelium can be seen.



Fig 4: Cornea of a chinchilla with dense fibrosis and scarring due to chronic irritation.

antibiotic eye drops (q8h) is suggested. Antibiotics are recommended because the corneal epithelium normally serves as a physiologic barrier, and a scratch exposes the eye to microorganisms from the ocular surface, conjunctiva sac and environment. Ointments should be avoided because of the accumulation of lipid material in the ocular area.

Topical or systemic NSAIDs, as well as atropine to relieve a miotic and spastic pupil, may be used. The authors' clinical impression is that these superficial corneal erosions are not extremely painful. Some of them

even develop into indolent ulcers without any neovascularization and show a delayed wound healing. As NSAIDs not only decrease pain but also slow down neovascularization and wound healing, the benefit of their use has to be questioned for each individual case. Furthermore, it seems that some client's compliance is better if they must apply only a single medication. Therefore in the authors' experience, most of these situations are handled best with only topical antibiotics.

The healing of a cornea in a healthy chinchilla can be expected to occur

within 10 days, so a recheck examination of the eyes can be scheduled at that time. The owner should be questioned about the housing conditions and bathing habits of the chinchilla. If necessary, changes should be initiated. It is recommended to avoid dust bathing during an ocular infection and to take away shavings if used for the housing.

Further Reading

1. Morreale RJ: Corneal diagnostic procedures. Clin Tech Small Anim Pract 18(3):145-151, 2003.
2. Peiffer RL, Johnson PT: Clinical ocular findings in a colony of chinchillas (*Chinchilla lanigera*). Lab Anim 14(4):331-335, 1980.
3. Detwiler SR: The eye of the chinchilla (*C. lanigera*). J Morphol 84(1):123-143, 2005, published online.



MILLER SCHOOL OF MEDICINE UNIVERSITY OF MIAMI

- Academic based diagnostic service with over 15 years of active involvement in clinical research and diagnostics
- In house ranges for small mammals and exotics
- Infectious disease testing for rodents
- Special handling of low volume samples
- Active research program
- Web access for patient results

Phone: (800) 596-7390
Email: compathlab@med.miami.edu
Website: <http://pathology.med.miami.edu/cpl>



LYON TECHNOLOGIES VET PRODUCTS

THE LYON ADVANTAGES:

- INNOVATIVE DESIGN & ENGINEERING
- RELIABLE PERFORMANCE
- QUALITY ASSURANCE

Ideal products for veterinary professionals dealing with exotics. Our Intensive Care lines are an excellent and indispensable tool to the many facilities and veterinarians who have come to depend on them.

Our commitment is to stand behind our quality products by providing excellent customer service.

Lyon Technologies, Inc.
1690 Brandywine Avenue
Chula Vista, CA 91911 U.S.A.

Sales (888) LYON-USA Fax (619) 216-3434
www.lyonusa.com e-mail: info@lyonusa.com



Pro-Care 27



Animal Intensive Care Units



Anesthesia Chambers

Alternative Method for Cable Tie Shell Repair in Chelonia

Christopher Lloyd, BVSc, MSc, CertZooMed, MRCVS, Nad Al Shiba Veterinary Hospital, Dubai, United Arab Emirates

A method of using cable ties to repair shell fractures in chelonia has been described (Forrester H, Satta J: Easy shell repair. *Exotic DVM* 6[6]:13, 2004). In the absence of cable tie guns and cable tie mounts the author has experienced good results using aluminum picture hooks, a glue gun and heavy duty cable ties. The methodology is extremely simple. The hooks and ties remain firmly in place for at least 6 months but are easy to remove with an elevator or screw driver, causing no lasting damage to the shell.

Case 1

The use of this technique is demonstrated in a minimally displaced carapacial fracture in a spur-thighed tortoise (*Testudo graeca*). A glue gun was used to pre-place the hooks peripherally to a freshly cleaned and debrided wound (Fig 1). The dorsoventral fracture was initially reduced by cable ties before the cranio-caudal fracture was reduced with a heavy-duty circular cable tie (Fig 2). This fracture healed uneventfully, and the external fixation was removed after 6 months.



Fig 1. Hooks were pre-placed to a freshly cleaned and debrided wound.



Fig 2. The dorsoventral fracture was initially reduced by cable ties.

Special veterinary tools for special exotic animals.



See our complete line of veterinary hospital tools for your exotic animal practice at www.vet-products.com.



Veterinary Specialty Products

Innovative solutions for exotic animal hospitals.™

1-800-362-8138 913-268-3108

© 2005 Veterinary Specialty Products, Inc.



TIPS & TRICKS

Case 2

This African spurred tortoise (*Geochelone sulcata*) had extensive carapacial injuries following a car accident that resulted in significant displacement of the caudal and ventral carapace. There was also a fracture of the left tibia and multiple smaller non-displaced fractures across the cranial aspects of the carapace. A large piece of carapace was missing, the coelomic membrane had been damaged and the coelomic cavity was exposed.

Following debridement and suturing of the coelomic membrane, the minor hairline fractures were stabilized with fiberglass while the major fractures were reduced as much as possible and stabilized with picture hooks and cable ties (Fig 3). The shell deficit was packed with wet to dry dressings, and the entire caudal carapace was bandaged. Bandages were changed daily for the first 2 weeks and then less frequently. Figure 4 shows the deficit after 4 weeks and Figure 5 shows the deficit after 12 weeks. The fiberglass and ties were removed after 7 months (Fig 6).



Fig 3. Fiberglass was used to stabilize the hairline fractures. Picture hooks and cable ties were used on the major fractures.



Fig 4. Shell fracture is shown after 4 weeks.

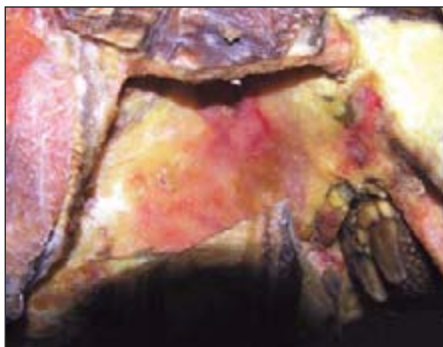
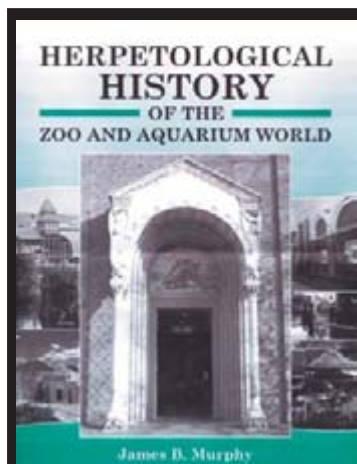


Fig 5. Shell fracture is shown after 12 weeks.



Fig 6. The fiberglass and ties were removed after 7 months.



HERPETOLOGICAL HISTORY OF THE ZOO AND AQUARIUM WORLD

by **James B. Murphy**
Foreword by Roger Conant

Orig. Ed. 2007 • 344 pp.
ISBN 1-57524-285-0 • \$79.50

This book chronicles the rich and often unique contributions that the staffs of the world's zoos and aquariums have made to our understanding of the biology of amphibians and reptiles, and to the development of herpetology as a discipline.

e-mail: info@krieger-publishing.com • www.krieger-publishing.com



KRIEGER PUBLISHING COMPANY

P.O. Box 9542 • Melbourne, FL 32902-9542 • 1-800-724-0025 Toll Free
Phone: (321) 724-9542 • Fax: (321) 951-3671

Unusual Pet Care

VOL. II

FOR THE EXOTIC GUIDE BOOK

NEW!

Includes 26
new species

Zoological Education Network
800-946-4782 or 561-641-6745
www.exoticdvm.com

Bone Pin Staples for Tortoise Shell Repair

Sergio Sarmiento Valiente, DVM, Exoticos Vet Clinic, Palma de Mallorca, Spain

I have developed a technique for shell repair in tortoises that uses staples made from bone pins to align the fracture.

Case 1



Fig 1. A Hermann's tortoise (*Testudo hermanni*) presented with a clean dorsal fracture on the carapace. The fracture was cleaned, and staples were created from intramedullary bone pins.



Fig 2. The fracture was reduced, and a potential site for drilling the first staple hole was marked on one side of the shell fragment. After the hole was drilled, the staple was inserted and a second hole was marked and drilled on the opposite side to align the fragments as closely as possible.



Fig 3. Once the staples were in place, the fracture site was considered stabilized for 24 to 48 hours and was covered with adhesive tape for protection.



Fig 4. The stapled fracture line was cleaned again, and a resin was applied to the site. One should choose a resin that releases the least amount of heat during curing.



Fig 5. During the actual hardening of the resin, the front leg was restrained with adhesive tape.



Fig 6. The final step was to paint over the resin in a pattern similar to the natural shell so the animal would be protected from potential predators for the entire year that the resin would be in place. At the end of the healing time, the resin residue was removed along with the staples.



TIPS & TRICKS

Case 2



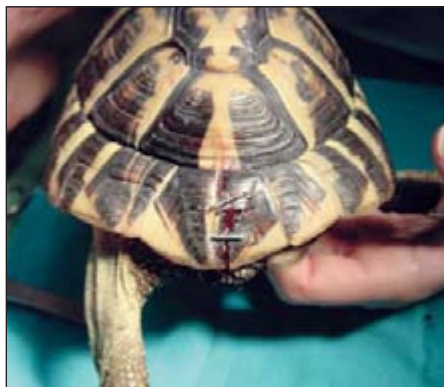
Fig 8. A Hermann's tortoise (*Testudo hermanni*) presented with the shell cracked on both the caudal and lateral aspects.



Fig 9. In this case, we numbered the staples so there would be no confusion during insertion because each homemade staple might be slightly different from the others.



Figs 10, 11. As in Case 1, the fractures were cleaned and the staples carefully applied to bring the edges into apposition.



Figs 12, 13. Resin was applied and the affected area was painted to resemble the original shell.



Evaluating Birds' Feet Through Glass

Greg J. Harrison, DVM, Dipl Emeritus ABVP - Avian Practice,
South Palm Beach, Florida

The plantar surface of a bird's feet can reveal characteristics of the general health and overall nutritional state of the bird. It is difficult to have good exposure of the entire foot surface during a regular physical examination because an active bird will immediately clench its feet during restraint. To overcome this, the bird can be placed on a glass panel or in an all-glass aquarium and the feet viewed from below. This technique also provides an alternative for long-distance consultations where the client can photograph the feet from this perspective.

The Amazon in this case is exhibiting some dryness and flaking of skin on the plantar surface of the feet as well as bald patches. The bird was eating a formulated diet, so recommendations to the client were to reduce the amount of "treats," increase the sources of omega 3 fatty acids in the diet (e.g., canola oil, flax seeds, walnuts), and possibly expose the bird to natural sunlight each day.

Use of a Prosthesis for Severe Carapace Defects

Sergio Sarmiento Valiente, DVM, Exoticos Vet Clinic, Palma de Mallorca, Spain

In cases where a large amount of the carapace is severely damaged or missing, I have found that a shell prosthesis protects the tissues and allows new bone to grow.

We begin by selecting the appropriate mold from among those we have made of polyester fiberglass using different-sized turtles. We apply a

fresh layer of fiberglass mass to create a negative print of the affected shell in order for the prosthesis to adhere closely to the bone. After the custom prosthesis hardens, we disinfect the material with an F10 solution and rinse with sterile fluids prior to attaching it in place. We use a 2-component quick glue that gener-

ates very little heat during curing.

The two cases of Hermann's tortoises (*Testudo hermanni*) illustrated below maintained the prosthetic carapace in place for 1 year. Each grew a new layer of bone at the site of the damage.

Case 1



Figs 1a-d. **a)** The tortoise was presented with severe damage to the carapace. **b)** The prosthetic device was customized and applied. **c)** The device was painted to simulate the natural shell colors. **d)** After 1 year, the prosthesis was removed to reveal new bone growth. Note that the color pattern of the new bone is different from the original; this reaction is similar to skin that has healed following a severe burn.

Case 2



Figs 2a,b. **a)** The tortoise sustained lateral damage to the shell. **b)** The prosthesis is in place and has been painted.

We have used this technique in more than 15 cases. The most difficult ones are those in which the damage affects the margin between the bone and skin, as those are difficult to seal properly.



Technique for Intubating Rabbits

Susan Kelleher, DVM, Broward Avian & Exotic Animal Hospital, Pompano Beach, Florida

Rabbit intubation can be accomplished by visualizing the glottis with a Miller #0 laryngoscope blade. The technique can be difficult to master at first, but with practice it can be accomplished in a matter of seconds.



Fig 1. After I premedicate the rabbit with Domitor® (100 µg/kg), I engage the help of an experienced holder, who is positioned behind the rabbit and holding the mouth open with gauze straps around the upper and lower incisors. It helps if the holder extends the maxilla slightly more rostral than the mandible.



Fig 2. I like to use a 1/16th IM pin with the sharp tip nipped off as a stylet. The tip of the stylet is bent approximately 30 degrees to help accommodate the curve in approaching the trachea.



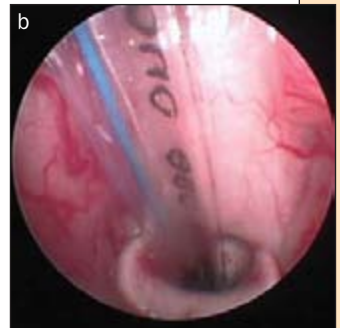
Fig 3. I prefer to spritz the larynx with about 0.1 cc lidocaine and then mask the rabbit down for a few moments with isoflurane before introducing the tube. The key is to hold the laryngoscope in your right hand and insert it into the mouth sideways with the bulb side toward the roof of the rabbit's mouth. The blade is extended to the back of the mouth before any pressure is placed on the tongue; otherwise the tongue will bulge up and obscure the larynx.



Fig 4. This is the initial view one normally sees when the epiglottis is above the soft palate. A gentle touch or soft tap with the tip of the tracheal tube will collapse the epiglottis to the back of the tongue so the opening to the trachea can be visualized.



Fig 5. This is the view we are after.



Figs 6a,b. a) The endotracheal tube is then inserted and attached to isoflurane for the procedure. b) Some figures were obtained with the use of an endoscope for illustration purposes only, because an endoscope is not necessary for this access.





Testicular Interstitial Cell Neoplasia in a Rabbit

Ariana Finkelstein, DVM and Lynne Cassone, DVM



Ariana Finkelstein, DVM
Southeast Animal Hospital
San Antonio, Texas
AFinkelstein@southeastanimalhospital.com

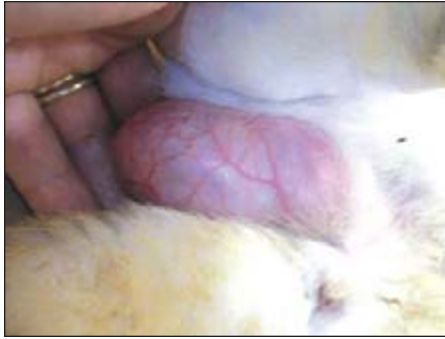
Lynne Cassone, DVM
Texas Veterinary Medical Diagnostic
Laboratory System
College Station, Texas

A 5-year-old, 5.6-lb (2.54-kg), male mini rex rabbit presented to the Southeast Animal Hospital for evaluation of a testicular swelling of several month's duration (Figs 1, 2). The physical examination findings were within normal limits, except for a swollen firm right testicle of approximately 3" x 2" (7.6 cm x 5 cm). The testicle was not painful or hot on palpation. A primary testicular neoplasia was suspected.

The diagnostic plan, which included blood work and whole body radiographs with emphasis on the thorax, were performed pre-operatively with the rabbit under isoflurane anesthesia. Blood work showed mild hypoglycemia (secondary to stress); hypokalemia (possibly due to sample handling when sent out for processing) and a mildly elevated alkaline phosphatase (because alanine transaminase, bilirubin, albumin and blood urea nitrogen results were within normal reference ranges, this was considered an incidental and nonspecific finding). All other hematology and serum biochemistry parameters were within normal limits. Radiographs were also within normal limits for the species, and no evidence of metastasis was seen.

The rabbit was admitted for surgery within 24 hours of the diagnostic workup. Due to its fractious nature, the patient was anesthetized with isoflurane and oxygen via a box induction method and maintained by mask. Butorphanol was administered (0.6 mg or 0.24 mg/kg IM) pre-operatively. A 22-ga intravenous catheter was placed in the cephalic vein of the rabbit's right front leg, and a multiple electrolyte solution (Plasma-Lyte -Baxter) was administered at 2 times the maintenance dose ($BW \text{ lbs} \times 60 \text{ ml/lb/day} \div 24 = 15 \text{ ml/hour}$). The anesthetized rabbit was placed in dorsal recumbency and a pulse oximeter device placed on its ear to monitor heart rate and oxygen saturation.

The left testicle was not palpable pre-operatively. Normal aseptic preparation was performed. A traditional pre-scrotal incision was enlarged to allow removal of the abnormally large right testicle that was adhered to the scrotum. A monofilament absorbable suture (3-0) was chosen because of its ease of use, minimal tissue drag and minimal tissue reaction. The spermatic cord, deferent duct and vessels



Figs 1, 2. A testicular tumor was suspected in a mini rex rabbit presented with a testicular swelling.

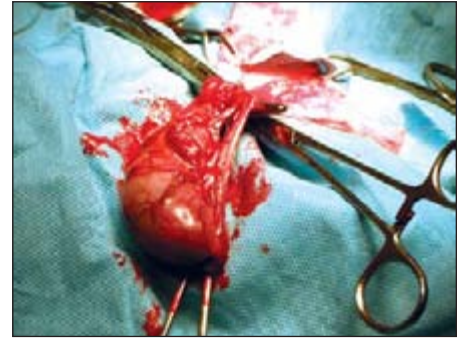


Fig 3. The testis was removed following ligation of the spermatic cord, deferent duct and vessels.



Fig 4. Tissue glue was applied over the sutures.



Fig 5. The tumor was submitted for histopathologic evaluation.

were transfixed and double ligated (Fig 3) according to the procedure described by Capello.¹ The left testicle was still not palpable and was suspected to be atrophied due to the larger right side. The owner declined a full surgical exploratory to locate the second testicle. The incision was closed subcutaneously with simple continuous sutures of 3-0 monofilament absorbable suture, and the skin was closed with a subcuticular pattern. Tissue glue was applied (Fig 4). Buprenorphine was administered (0.05 mg or 0.02 mg/kg) divided subcutaneously and intramuscularly. Recovery was uneventful. Meloxicam (0.45 mg or 0.18 mg/kg) was dispensed for oral use once daily for 3 days.

The testicle (Fig 5) was submitted to the Texas Veterinary Medical Diagnostic Laboratory for histopathologic evaluation. The results yielded a testicular interstitial cell tumor. This well differentiated tumor exhibited no evidence of cellular atypia, mitotic activity or stromal invasion. The testicular architecture was replaced by an expansile well demarcated mass characterized by large cysts and clefts lined by multiple layers of polygonal cells with apical nuclei. Cells contained moderate quantities of eosinophilic occasionally finely vacuolated cytoplasm with distinct borders and round to ovoid nuclei. Anisocytosis and anisokaryosis were mild, and mitotic figures were rare. No cells extended along the spermatic cord or exhibited stromal invasion.

Discussion

Testicular neoplasia is uncommon in lagomorphs.⁶ Benign interstitial cell tumors (Leydig cell tumors) of mature male rabbits have been described in the literature.²⁻⁵ These cells do not seem to produce excessive androgen secretion in multiple animal species (older domestic bulls, Fisher rats). A recent report describes a tumor that may have hormonal stimulation related to the tumor.⁷ However, because the patient was euthanized prior to diagnosis in that case, it is unknown if castration would have resolved the gynecomastia. In this case, the tumor appears to have benign behavior. Three months postoperatively the rabbit has continued to do well, unlike the rabbits in other reports that were sacrificed prior to diagnosis.^{2-4,7}

References and Further Reading

1. Capello V: Surgical techniques for orchiectomy of the pet rabbit. *Exotic DVM* 7(5):23-32, 2006.
2. Marino F, Ferrara G, Rapisarda G, Galofaro V: Reinke's crystals in an interstitial cell tumour of a rabbit (*Oryctolagus cuniculus*). *Reprod Domest Anim* 38(5):421-422, 2003.
3. Roccabianca P, Ghisleni G, Scanziani E: Simultaneous seminoma and interstitial cell tumour in a rabbit with a previous cutaneous basal cell tumour. *J Comp Pathol* 121(1):95-99, 1999.
4. Zwicker GM, Killinger JM: Interstitial cell tumors in a young adult New Zealand white rabbit. *Toxicol Pathol* 13(3):232-235, 1985.
5. Platt RE, Weisbroth SH: Interstitial cell tumor of the testicle in rabbits: A report of two cases. *Lab Anim Sci* 24(4):682-685, 1974.
6. Heatley JJ, Smith AN: Spontaneous neoplasm of lagomorphs. *Vet Clin No Am Exot Anim Pract* 7(3):561-577, 2004.
7. Maratea KA, Ramos-Vara JA, Corriveau LA, et al: Testicular interstitial cell tumor and gynecomastia in a rabbit. *Vet Pathol* 44(4):513-517, 2007.
8. Robertson JA, Andrews GA: Theriogenology question of the month. Bilateral cystic interstitial cell tumors. *J Am Vet Med Assoc* 230(6):827-829, 2007.





Penile Amputation and Urethrostomy in a Rat

Véronique Mentré, DVM



Véronique Mentré, DVM
Clinique Vétérinaire
Montigny les Corneilles, France
vmentre@hotmail.com

Dr. Mentré graduated from the école National Vétérinaire de Maisons-Alfort, France in 2001. Following an internship in small animal medicine and surgery, she spent several months in a clinical practice near Washington, DC. Since 2003, she has worked in a small animal practice outside Paris, where she sees exotic pets on a first opinion and referral basis.

A 1.5-year-old, 300-g, intact male rat presented for a mass on the prepuce that was grossly inflamed and ulcerated. The mass was noted by the owner approximately 1 month prior to presentation and was increasing in size. No other abnormalities were noted on the physical examination, and the rat exhibited normal behavior.

Examination of the prepuce revealed an ulcerative, hemorrhagic, proliferative 6-mm mass at the distal aspect (Fig 1). The penis was incorporated within the mass and impossible to exteriorize. The owner reported the rat urinated spontaneously but infrequently, which might have been due to the obstructive nature of the mass. Palpation of the abdomen revealed a small bladder that was not thickened or painful. The urine was macroscopically normal on visual examination. Further analysis of the urine was not performed.

A penile and/or preputial tumor was the primary rule out. A surgical approach, including excision of the mass with possible penile amputation and urethrostomy, was proposed to the owner. The prognosis was guarded due to the infiltrative nature of the mass and the postoperative risk of urethral stenosis.



Fig 1. Shown is the general appearance of the mass in the young rat.

Surgical Procedure

The rat was pre-medicated 30 minutes prior to surgery with enrofloxacin (10 mg/kg SC) and meloxicam (0.2 mg/kg SC). The rat was induced with 4% isoflurane via a facemask and maintained on 3% isoflurane with a non-rebreathing system for the surgical procedure. Cardiac function was monitored with an electrocardiogram.

The rat was positioned in dorsal recumbency on a microwaveable Snugglesafe™ heating pad. The abdomen was shaved and surgically prepared with povidone iodine scrub and solution. A circumferential incision was made around the mass and then bluntly dissected with Severin scissors. Hemostasis was achieved during surgery using sterile cotton-tipped applicators. Meticulous hemostasis was mandatory due to the small size and

blood volume of the patient.

The penis was visualized and carefully dissected from the mass. The distal aspect of the penis was completely incorporated into the mass (Figs 2, 3); therefore, penile amputation was necessary. The penis was transected with a scalpel 1 cm proximal to the mass (Fig 4). A 22-gauge intravenous catheter was inserted into the urethra (Fig 5), and urethrostomy was performed. The urethral mucosa was sutured to the skin, as is performed in other mammalian species, using 6-0 polyglactin 910 suture (Vicryl). The ventral aspect of the prepuce and the excision margins were closed with Vicryl 4-0 suture. The catheter was then sutured to the skin with single interrupted Vicryl 4-0 sutures (Fig 6).



Fig 2. The mass involved the prepuce and the tip of the penis.

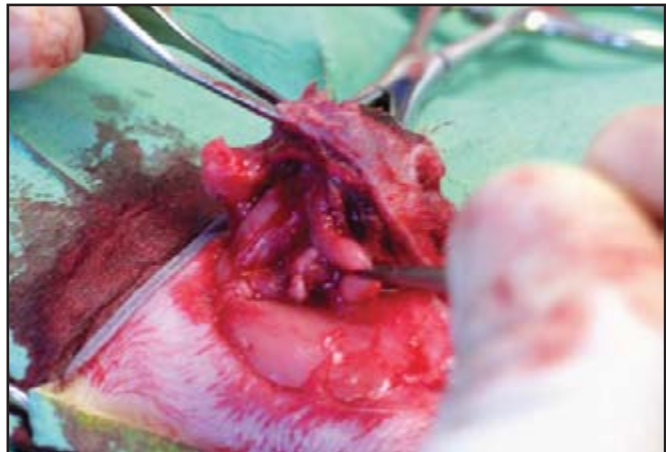


Fig 3. The mass was dissected to visualize the penis.

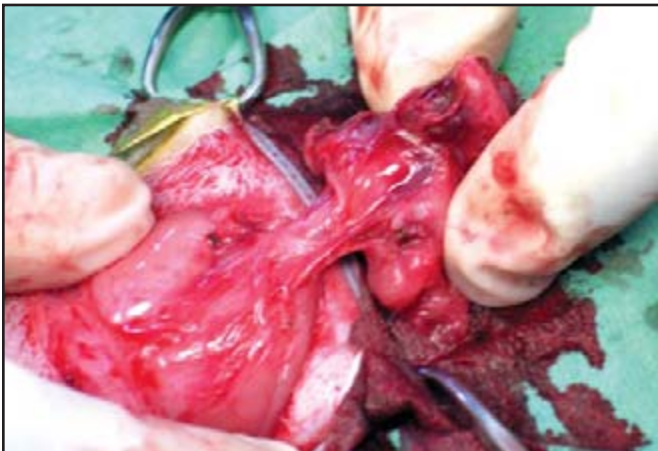


Fig 4. The penis was freed and the mass completely dissected.

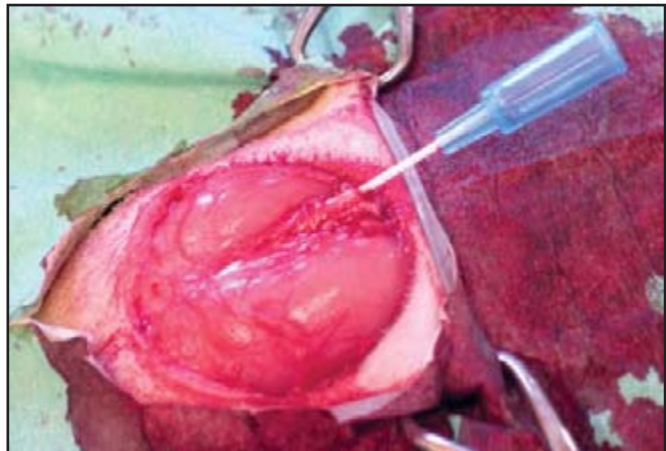


Fig 5. The urinary catheter was placed prior to the urethrostomy.



Fig 6. The catheter was sutured to the skin.

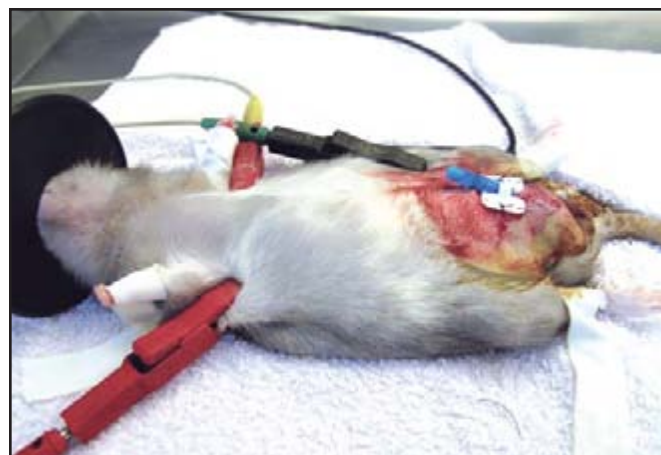


Fig 7. Recovery from the surgical procedure was uneventful.

Post-Surgical Care

A head collar was created using radiographic film to protect the surgery site and catheter during the post-operative period. The collar was fitted to the patient prior to recovery. The rat recovered from anesthesia on the Snugglesafe™ warming unit without complication. During the hours following surgery the rat appeared painful (hunched back posture, little movement). Meloxicam (0.1 mg/kg PO q24h) was administered. Enrofloxacin (10 mg/kg SC q12h) was continued in the evening.

The day after surgery the rat was more alert, active and eating well. Micturition appeared to be normal, and the surgical site showed no anomaly. The rat was discharged with its collar and catheter in place. Postoperative instructions included oral administration of injectable enrofloxacin (10 mg/kg PO q12h) and meloxicam (0.1 mg/kg PO q24h). The owners were advised to monitor for head collar tolerance, appetite and micturition and to

replace the normal bedding with paper towels.

The clinical examination was normal during a postoperative visit 3 days later. The owner reported normal micturitions, and abdominal palpation revealed a small bladder. The surgical site was clean and the sutures and urinary catheter were in place. The rat was not tolerating the head collar well, as moderate moist dermatitis was noted on the neck. The owners were encouraged to clean the neck with chlorhexidine twice daily.

The rat died 10 days after the postoperative visit. No abnormalities are noted on the external examination, bladder palpation or at the surgical site, and the catheter was still in place. The owner declined a necropsy.

Histopathology of the mass revealed an epidermoid carcinoma that was moderately differentiated and moderately infiltrative. The excision margins were infiltrated by neoplastic cells.

Discussion

Cutaneous tumors in rats are rare compared to the incidence of mammary gland tumors. They are also rare in rats less than one year of age.

Several laboratory lineages (Fischer 344, for example) have shown a particularly high prevalence of tumors of the preputial and clitoral glands, up to 90% in males and 70% in females.²

Tumors of the preputial glands usually derive from the acini or from the epithelium of the excretory duct. Mesenchymal tumors are rare. Preputial adenomas are seen most frequently and may be simple or multiple and involve one gland or both. They are mostly circumscribed. Adenocarcinomas are usually larger (up to 30 mm in diameter), the skin is often ulcerated and the tumor infiltrative. Adenocarcinomas may have several origins, but normal glandular structure is usually not visible on pathology.³

In this case, the absence of a necropsy prevented the determination of the cause of death. The urethrostomy had been well tolerated and there had been no evidence of a urethral stenosis during the postoperative period.

Surgical difficulties in this species are primarily linked to the small size of the animal. Because one must be careful about hypothermia during the procedure, it is necessary to place the animal on a thermoregulation device during surgery and, if possible, recovery. Blood loss must also be monitored closely. Use of electro-surgery, electrocoagulation or, more simply, sterile cotton-tipped applicators, allows the surgeon to control bleeding efficiently.

Preoperative analgesia is imperative in small mammals. Administration of meloxicam pre- and post-operatively provided analgesia in this case.

Urethrostomy in small exotic mammals is a rare surgery, but the technique employed is similar to that in larger mammals. Protection of the surgical site is a primary concern postoperatively, as rodents are adept at chewing sutures and causing damage to the incision. Owners must be well educated on postoperative care and patient monitoring during the healing stage.

Products at a Glance

- Enrofloxacin - Baytril 5% injectable, Bayer HealthCare, www.bayer-ah.com
- Meloxicam - Metacam 5 mg/ml injectable, Boehringer Ingelheim, www.boehringer-ingelheim.com
- Isoflurane - AErrane, Baxter SAS, www.baxter.com
- Electrocardiogram - Cardiorapid, www.electrocardiographie.com
- Heating pad - Snugglesafe, LenricC21 Ltd, www.snugglesafe.co.uk
- Polyglactin 910 suture - Vicryl, Johnson and Johnson Intl, www.jnjgateway.com

References and Further Reading

1. Donnelly TM: Diseases of small rodents. In Quesenberry KE, Carpenter JW (eds): *Ferrets, Rabbits and Rodents: Clinical Medicine and Surgery* 2nd ed. Saunders-Elsevier, 2004.
2. Reznik G: Pathology of the clitoral and preputial glands. In Mohr V, Dungworth DL, Capen CC: *Pathobiology of the Aging Rat* Vol 2. Ilsi Press, 1992, pp 436-441.
3. Springer-Verlooy, Benirschke K, Garner FM, Jones TC: *Pathology of Laboratory Animals* Vol 1. 1978, pp 586-588.



The Rat Assistance & Teaching Society




The Rat Health Care Booklet
-12th ed. now available-
Practical and effective treatments,
developed through 20 years of
experience with hundreds of rats.

Please see "info for vets"
at: www.petrats.org

Free client brochures, too!

(530) 899-0605
www.petrats.org





AEMV

ASSOCIATION OF EXOTIC
MAMMAL VETERINARIANS

AEMV membership* provides many benefits, including:

- Discount registration** to AEMV continuing education opportunities
- Members-only web database** of client education materials
- Subscription** to the *Journal of Exotic Pet Medicine*

*Membership is restricted to veterinarians, veterinary students, and veterinary staff only.

PO Box 396, Weare, NH, USA 03281-0396
info@aemv.org fax 603-529-4980
www.AEMV.org



Intraoral Radiographic Technique in Lagomorphs and Rodents*

Estella Böhmer, Dr med vet



Estella Böhmer, Dr med vet
Clinic of Veterinary Surgery
Faculty of Veterinary Medicine
Ludwig-Maximilians-University
Munich, Germany
e.boehmer@lmu.de

Dr. Böhmer is a 1981 graduate from the Faculty of Veterinary Medicine, University of Ljubljana in Yugoslavia. She received her Dr med vet degree in 1985 from the Clinic of Veterinary Surgery, Faculty of Veterinary Medicine, Ludwig-Maximilians-University, Munich, Germany. In 1987 she became a member of the German Board of Veterinary Surgeons. Since 1996 she has been Assistant Medical Director (exotic mammals and dentistry in cats and dogs) at Ludwig-Maximilians-University.

Radiography is an important tool for examining tooth and jaw disorders in rabbits and rodents. In a clinical examination, even with the most sophisticated intraoral visual inspection, the majority of extraoral changes in teeth and/or jaw bones often cannot be fully identified. Radiographic findings, however, can help determine choice of the correct treatment and long-term prognosis. Radiographs can also be helpful when discussing therapeutic and prophylactic options with the client.

The conventional 4 radiographic projections (latero-lateral and dorsoventral skull views as well as 40-degree oblique views of both sides) usually can be obtained without anesthesia (one film divided into 4 sections). There are several other projections for specific additional studies of the head available with the rabbit anesthetized. Especially noteworthy is the rostrocaudal projection (patient in dorsal recumbency), which usually gives a good overview of the mandibular joints in lagomorphs and rodents, as well as the dorsoventral projection (patient in ventral recumbency) with the patient's jaw being held wide open. The latter technique allows a good interpretation of the mandibular bodies and symphysis in guinea pigs and chinchillas. In rabbits, however, the mouth usually cannot be opened far enough to get a good image without superimposition of the maxillary bones. Therefore, if required, the mandibles in rabbits should also be radiographed by means of an intraoral x-ray technique. The deeply inserted intraoral dental film allows a good interpretation not only of the symphysis but also of each mandibular tooth.

**Adapted from two original papers published in German that describe radiographic evaluation of the skull and teeth in lagomorphs and rodents. Part I: Overall anatomy and pathology of the head, indications for x-ray diagnosis (Tierärztl Praxis 2001; 29[K]:316-327). Part II: X-ray diagnosis of tooth and jaw disorders in lagomorphs and rodents (Tierärztl Praxis 2001; 29[K]:369-383). Used with permission of Schattauer GmbH Publishers.*



Fig 1. Size #2 (31 x 41 mm) (Kodak® DF58) and size #0 (22 mm x 35 mm) (Kodak® DF 54) dental films.

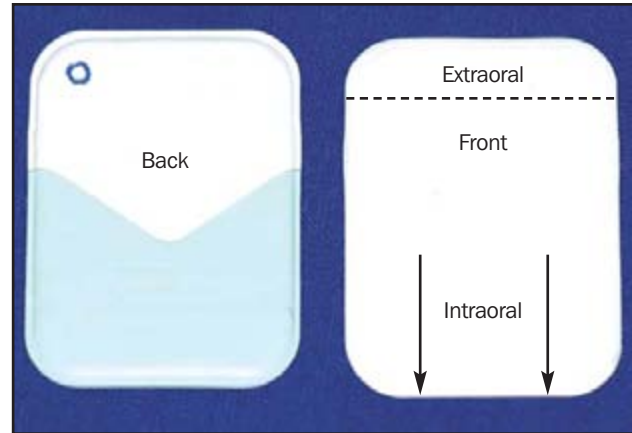


Fig 2. Back and front of a dental film.

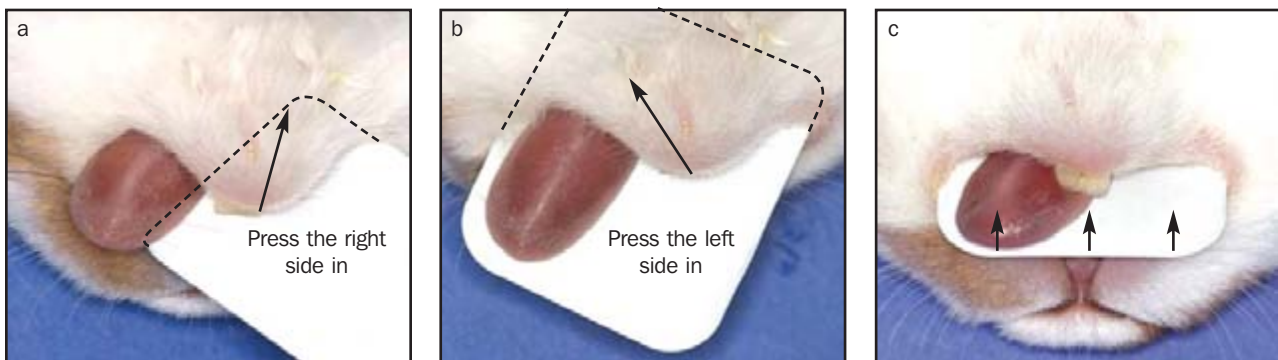


Fig 3a-c. Intraoral positioning of the film: arrows show the direction of inserting the film into the mouth.

INDICATIONS FOR INTRAORAL RADIOGRAPHY IN RABBITS

- **Structural changes** of the upper and lower incisors and molars (e.g., enamel or dentin hypoplasia, resorption, deformation, deviation and elongation of teeth)
- **Optimal visualization** of a single incisor or molar (without superimposition with other teeth or bone structures)
- **Tooth loosening**
- **Teeth-induced inflammation** of the maxilla or mandibula (periapical abscessation or osteomyelitis)
- **Mandibular or maxillar trauma** (e.g., fracture, fissure, tooth luxation, impaction)
- **Diseases of the nasolacrimal duct** (possible additional application of contrast media)
- **Rhinitis**
- **Neoplasia** (rostral two-thirds of the mandible or maxilla)
- **Palpable protuberances** of unknown origin (rostral two-thirds of the mandible or maxilla)

Limited Indications

- **Intraoral neoplasia** (difficulty in placing the film correctly)
- **Disorders that prevent positioning** the patient in dorsal or ventral recumbency

Radiographic Technique and Positioning

Small dental films are available in two sizes: size #2 (31 x 41 mm) (Kodak® DF58) and size #0 (22 mm x 35 mm) (Kodak® DF 54) (Fig 1). The larger ones are suited for rabbits, whereas the smaller ones can be used in guinea pigs, chinchillas and rats. The technique in small rodents is the same as described here in rabbits. Because all dental films contain a layer of lead foil inside the protective covering, it is important to closely inspect the films for correct intraoral placement. The uniformly white upper side of the film (Fig 2) must be aligned with the x-ray beam. This means with the anesthetized patient in dorsal recumbency, the white surface of the intraoral film is positioned upward. After retracting the tongue from the mouth and hence slightly opening the jaw, one corner of the film is inserted into the right oral vestibulum of the rabbit (Fig 3a). Then the other corner of the film is passed along the left oral vestibulum and carefully inserted into the mouth as far as possible (Fig 3b). Slight and repeated side movements of the film and continuous gentle traction of the tongue with the

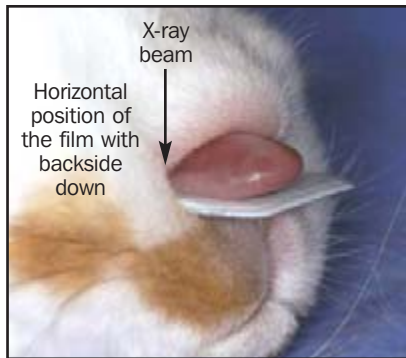


Fig 4. Horizontal positioning of the intraoral film (perpendicular to the x-ray beam).

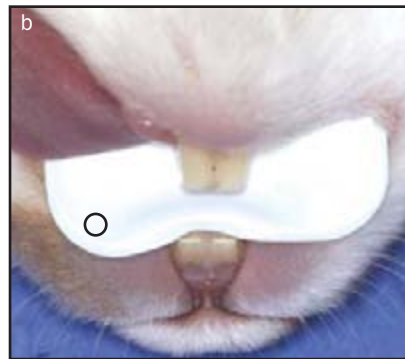


Fig 5. Intraoral film wedged behind the maxillary incisor teeth: **a)** skull; **b)** anesthetized rabbit; **c)** anesthetized guinea pig.

other hand facilitate intraoral placement. At last the dental film should be so deeply situated into the oral cavity that only a very small part of the protective cover is located beyond the maxillary incisors (Figs 3c, 4). In rabbits weighing more than 1.2 kg, the film can usually be wedged behind the maxillary incisors (Figs 5a,b). The smaller sized film is suited for the intraoral radiographic technique in guinea pigs and chinchillas (Fig 5c).

This technique can also be used in intubated rabbits (Fig 6). To avoid superimposition of the endotracheal tube with the dental film, the tube should be placed on the non-affected side of the jaw. In order to get optimal intraoral radiographs one should prevent bending the film too much while placing it into the mouth and ensure that the primary x-ray beam is directed perpendicular to the film axis, approximately centered on the first molar tooth (Fig 4).

Intraoral radiographs are obtained with the animal under general anesthesia, and the necessary precautions must be taken to meet the radiation safety requirements. The skull should preferably be taped to the table. In addition, the parallel technique is used so the x-ray beam should be aimed perpendicular to the film and not perpendicular to the bisecting angle

between the long axis of the film and the long axis of the incisor teeth. In this case (and if the film is not placed deep enough in the mouth), the fourth and fifth mandibular molar teeth cannot be visualized. The distance between the object and the x-ray equipment can be more than 50 cm (standard distance). A dental radiographic unit is not required, but if available, it should be used to reduce scatter radiation.

With a slight rotation of the skull (about 20 degrees to the left or right side without moving the x-ray equipment) and thus obtaining an oblique exposure of the intraoral dental film, an isolated view of each single incisor or cheek tooth in both lower jaws is possible (Figs 14b,c,e,f).

For radiographic examination of the upper incisors as well as all maxillary premolar and molar teeth (Fig 7), the animal is positioned in ventral recumbency. In the manner described above, the intraoral film is inserted deeply into the mouth, this time with the front of the film facing the maxilla. In order to ascertain that the film is in a horizontal position, the chin of the rabbit can be positioned on top of a small sponge.

If there are any concerns about the occlusal surface of the cheek teeth or the clinical crown of a single

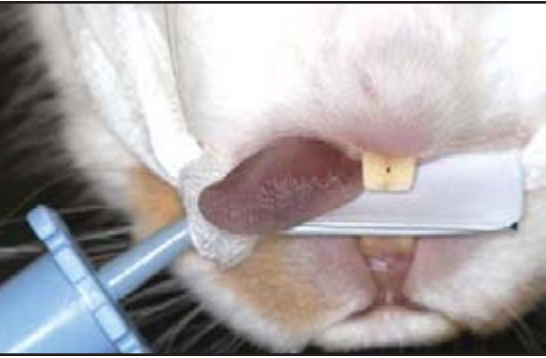


Fig 6. Intraoral film positioning in an intubated rabbit (film positioned between the tongue and tube).

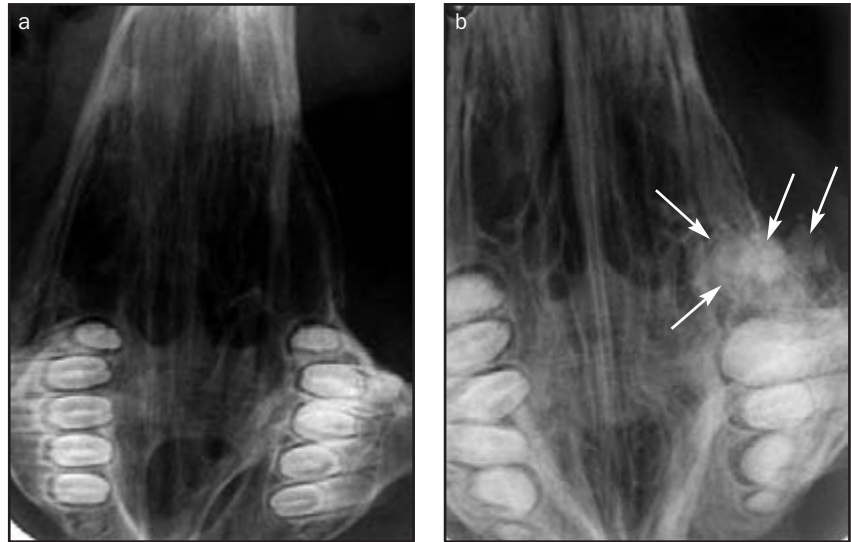


Fig 7. Radiograph of the upper jaw in a rabbit (animal in ventral recumbency): **a)** without any pathologic changes; **b)** slight malalignment of cheek teeth with absence/destruction of the left maxillary first and second cheek teeth.

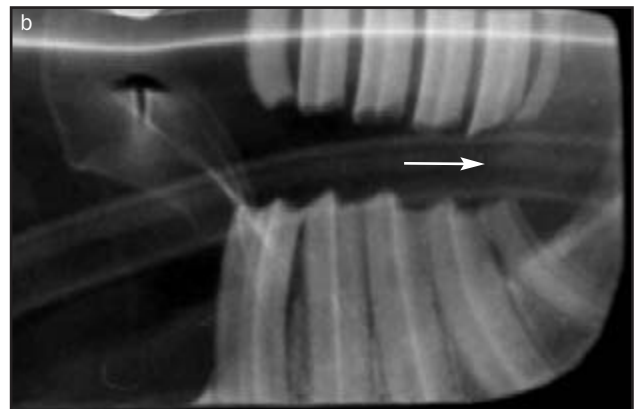
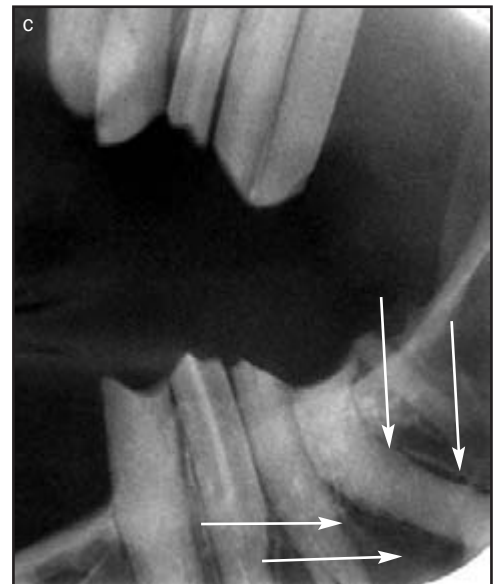


Fig 8. Intraoral radiograph with vertical positioning of a dental film (rabbit): **a)** skull; **b)** view of the maxillary and mandibular cheek teeth (clinical crowns) with normal occlusion (endotracheal tube is visible, arrow); **c)** malocclusion: uneven / stepped occlusal surface, deformation of the fourth cheek tooth with a distinct widening of the periodontal ligament space (arrows). Note that the apical portions of the teeth cannot be assessed with this technique.



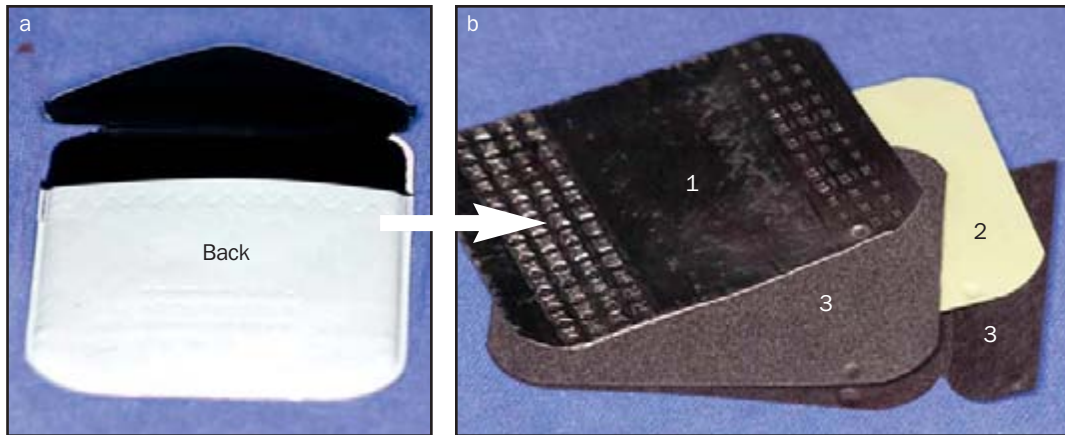


Fig 9. a) Unwrapped dental film (opened); **b)** 1) lead foil, 2) film, 3) paper.

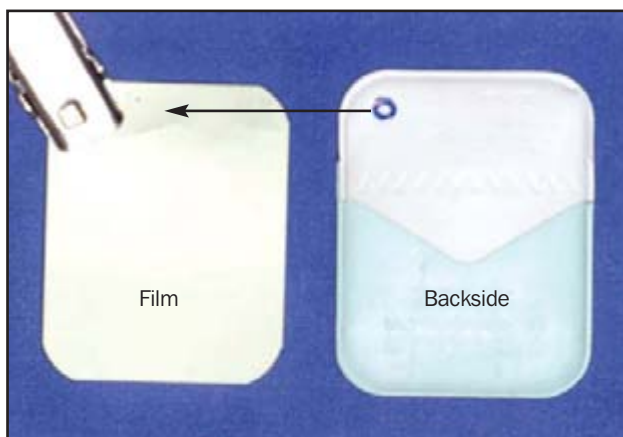
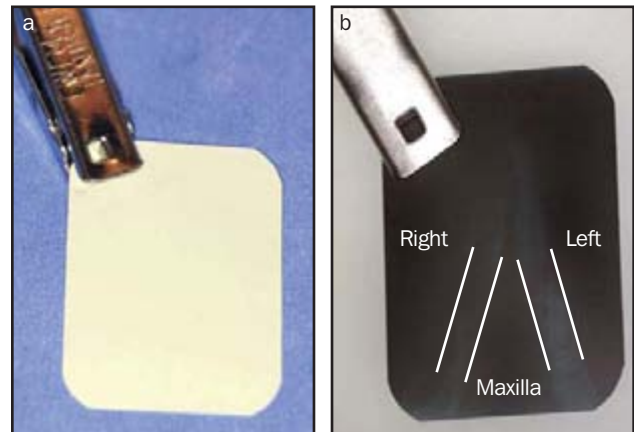


Fig 10. Fixation of the film with a clip: beneath the circle on the back of the film cover is a dot on the film itself that is palpable in the darkroom.



Figs 11a,b. Correct position of the clip (outside the imaged jaw).

tooth (e.g., caries), the dental film can be carefully bent along the longitudinal axis and then placed parallel to the teeth deeply into the mouth (Fig 8). Alternatively, the smaller intraoral film can be used (Fig 1). With the animal in lateral recumbency, the primary x-ray beam should be adjusted to the second cheek tooth. Here also a little sponge placed under the tip of the nose facilitates correct lateral positioning of the skull.

Film Processing

In a darkroom, the exposed dental film can be processed by hand (1 minute developing, rinse with water; 1 minute fixing, rinse with water), in an automatic dental processor, or in a conventional automatic processor (a large conventional film can be used with an adequate cutout for the intraoral film in order to function as a trailer). First of all, the protective cover is opened and the film removed. It is embedded between two layers of protective paper

and a layer of lead foil on the back (Fig 9b). On the one corner of the film is a small circle (dot) where the fixating clip should be placed (Figs 10, 11). This approach ensures that the clip is not located over the caudal part of the jaws on the radiograph (Fig 11b).

Conclusions

The intraoral technique is a valuable method for examining single affected teeth in the lower jaw as well as the upper jaw of rabbits and small rodents. This technique should be combined with routine skull radiographs (at least 4 images on 1 film) in order to have a good overview of the pathologic changes in case of malocclusion. As Fig.12a shows, the oblique projection sometimes cannot exactly identify which tooth should be extracted or assess the appearance of the jaw bone. In these special cases and in all cases concerning the incisors, an intraoral film provides complementary diagnostic imaging (Figs 13, 14).

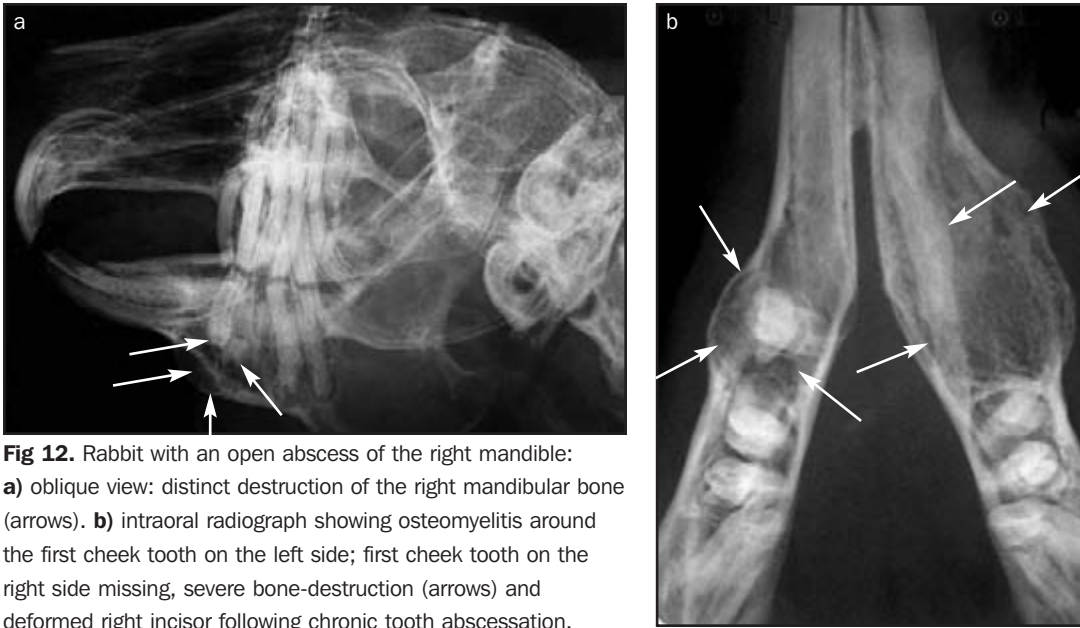


Fig 12. Rabbit with an open abscess of the right mandible: **a)** oblique view: distinct destruction of the right mandibular bone (arrows). **b)** intraoral radiograph showing osteomyelitis around the first cheek tooth on the left side; first cheek tooth on the right side missing, severe bone-destruction (arrows) and deformed right incisor following chronic tooth abscessation.

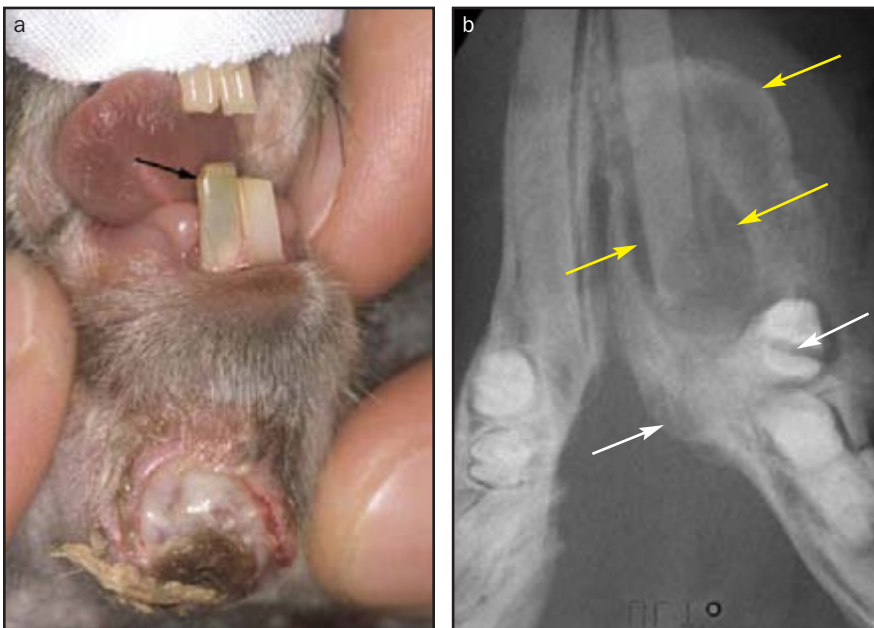


Fig 13. Rabbit with a nonaffected normal left mandible and an open abscess of the right mandible: **a)** The right mandibular incisor tooth is slightly elongated and discolored; **b)** intraoral radiograph: longitudinal fissuring of the first mandibular cheek tooth (white arrow), severe bone deformity (osteomyelitis) in consequence of an advanced periapical lesion (yellow arrows) of the right mandibular incisor tooth.



Fig 14. Intraoral radiographs of an anorectic rabbit: **a)** bilateral longitudinal fissuring of the first cheek tooth (yellow arrows); in addition clinical crown fracture of the left mandibular incisor tooth; **b)** slightly oblique intraoral radiograph: complete longitudinal fissuring of the first cheek tooth (yellow arrow, left side) with beginning perforation of the ventral cortical bone (white arrow); **c)** same finding on the right side; **d)** radiograph obtained after extraction of the first cheek tooth on both sides; small piece of tooth left in the alveolus (right side); **e)** same condition (slightly oblique right); **f)** same condition (slightly oblique left).

References and Further Reading

1. Böhmer E: Radiographic evaluation of the skull and teeth in lagomorphs and rodents. Part I: Overall anatomy and pathology of the head, indications for x-ray diagnosis. *Tierärztl Praxis* 29(K):316-327, 2001.
2. Böhmer E: Radiographic evaluation of the skull and teeth in lagomorphs and rodents. Part II: X-ray diagnosis of tooth and jaw disorders in lagomorphs and rodents. *Tierärztl Praxis* 29(K):369-383, 2001.
3. Capello V, Gracia M: *Rabbit and Rodent Dentistry Handbook*. Lake Worth, Zoological Education Network, 2005.



Northwest ZooPath Specializes in the Pathology of Nondomestic Species

Birds • Herps • Small Exotic Mammals • Aquatic Animals • Zoo & Wildlife • Laboratory Animals

“Outside of Spain, Garner is the best. In Spain he’d be unable to write a report in Spanish.”

Carles Juan-Sallés, LV, Dipl ACVP
Samalús (BCN), Spain

Northwest ZooPath

Conservation Through Disease Diagnosis



Michael Garner, DVM, Dipl ACVP ■ **John Trupkiewicz, DVM, Dipl ACVP**

654 W. Main St., Monroe, WA 98272 Phone: (360) 794-0630 Fax: (360) 794-4312

Web site: www.zoopath.com Email: zoopath@aol.com



Life's full of unexpected surprises – but you can always count on Puritan's consistent quality.

As the North American leader in specialty applicators, Puritan offers an array of single-use swabs that help you get the job done right. Take our 25-806 1PAR, for instance. Its fine, USP-grade cotton tip works well on smaller animals, providing you with ease of handling and reliable results every time. Veterinary medicine is demanding enough – don't let poor quality swabs jeopardize your results. Count on Puritan quality and avoid nasty surprises.

Free Veterinary Sample Pack

Call 800-321-2313 or go to www.puritanmedproducts.com/ex today to receive your free swab sample pack, and experience the Puritan difference for yourself.

ISO 9001:2000 ISO 15485:2005 CE

Tel 800-321-2313 (US and Canada), 207-876-3311
Fax 800-323-4153 (US and Canada), 207-876-3130
Web www.puritanmedproducts.com
Email sales@puritanmedproducts.com

Puritan Medical Products Company LLC, Gullford, Maine 04443-0149 USA
An affiliate of Hardwood Products Company

Puritan
Quality Medical Products Since 1919



Reptile Lighting is a Process Not a Bulb*

Henry Brames, Dr med vet and Frances Baines, MRCVS



Henry Brames, Dr med vet
Munich, Germany
henry.brames@t-online.de



Frances Baines, MRCVS
Wales, United Kingdom
fbaines@uvguide.co.uk

Henry Brames graduated from the Ludwig Maximilians University Veterinary School in Munich, Germany in 1981. He operates a reptile veterinary practice and a quality management consulting business. His special interests are preventive reptile medicine and the regulation of reptile immunity.

Frances Baines qualified from Cambridge Veterinary School in England in 1980. She is now retired from veterinary practice but has spent the last 3 years researching the use of ultraviolet lighting in reptile husbandry. She is author of the website www.uvguide.co.uk and UV advisor to the British and Irish Association of Zoos and Aquariums (BIAZA) Reptile & Amphibian Working Group.

As reptile veterinarians, we must have a proactive approach in caring for our patients, because optimal health includes an assessment of the overall welfare of the individual reptile.

Preventive reptile medicine should include:

- **strategic preventive health practices** that reduce the risk of communicable diseases and enhance metabolism through nutrition and feeding practices
- **hygiene**
- **composition of cagemates**
- **“enrichment”**—a broad group of behavioral management practices
- **the design** of the appropriate microhabitat including lighting.

It is also important to educate the reptile keepers as well as the commercial entities that produce, distribute and sell related merchandise or services and the affiliated regulatory agencies, hobbyist organizations and professional associations. If we are to keep reptiles in captivity, we cannot merely keep them alive—we must be committed to providing them the potential to live a high quality of life. Lighting is an extremely important facet of reptile welfare and health.

**Adapted from a poster presented during the 2007 Association of Reptilian and Amphibian Veterinarians annual conference.*

Many reptiles are heliotherms, relying heavily on direct sunlight to drive their physiologies. Others may live in indirect sunlight or be nocturnal or crepuscular. In all cases, their evolutionary history has resulted in modifications throughout their body to better utilize the light provided within their microhabitat. The anatomy of the typical reptilian eye varies substantially from the human eye and so they perceive and use light differently than we do. Because this fact is not appreciated by most reptile keepers, it may lead to anthropocentric misunderstandings resulting in preventable illnesses and deaths in captive reptiles. As reptile veterinarians, we have to promote our preventive knowledge as well as treat the ill reptile.

Reptiles are tetrachromats, possessing four independent channels for conveying color information (or four different cones), so they can see light well into the UV-A range (below 400 nm). Compared to humans, they have shifted peak sensitivities for their red, green and blue cones. They literally have a different world view (Fig 1).

Artificial lighting has been developed to suit human perception. Light bulbs provide a disjunct spectrum compared to sunlight, and most bulbs produce no UV-B and many produce very little UV-A. Most of these light bulbs were designed by humans to best serve human's visual frequencies, but the differences between what a human sees and what a lizard sees may dramatically influence reptiles' health by altering its behavior and failing to support key physiologic processes. Specifically, light modulates and supports the reptilian immuno-neuro-endocrine network (Fig 2).

Each of the over 8000 reptile species evolved in specific microhabitats with specific photoperiods and illumination. It is impossible to exactly replicate the natural light cycle of a reptile in captivity, but a healthful light environment can be achieved once one realizes that there is not a single "right" bulb for any situation. It requires thoughtful choices and implementation to provide appropriate lighting for a captive reptile and constant assessment and modifications to the process based on the reptile's health (Fig 3).

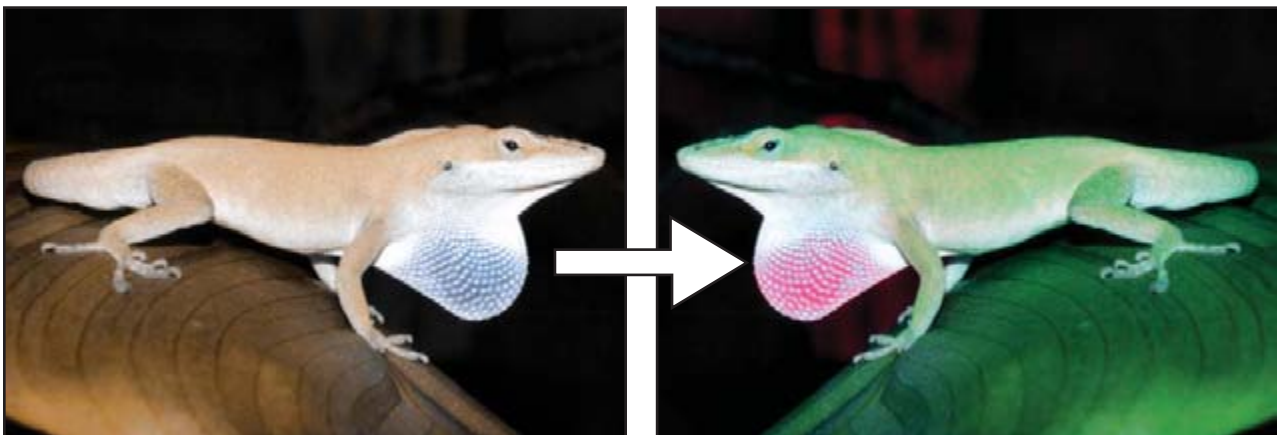


Fig 1. Reptiles deprived of UV-A are effectively rendered "color-blind." To imagine what this might be like, compare the above simulation of what a male anole looks like to a color-blind (protanope) human, with its appearance to a human with full-color vision.

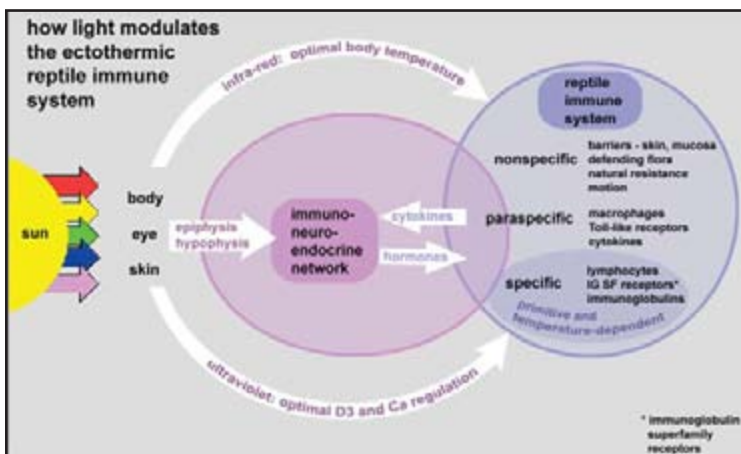


Fig 2. How light modulates the ectothermic reptile immune system.

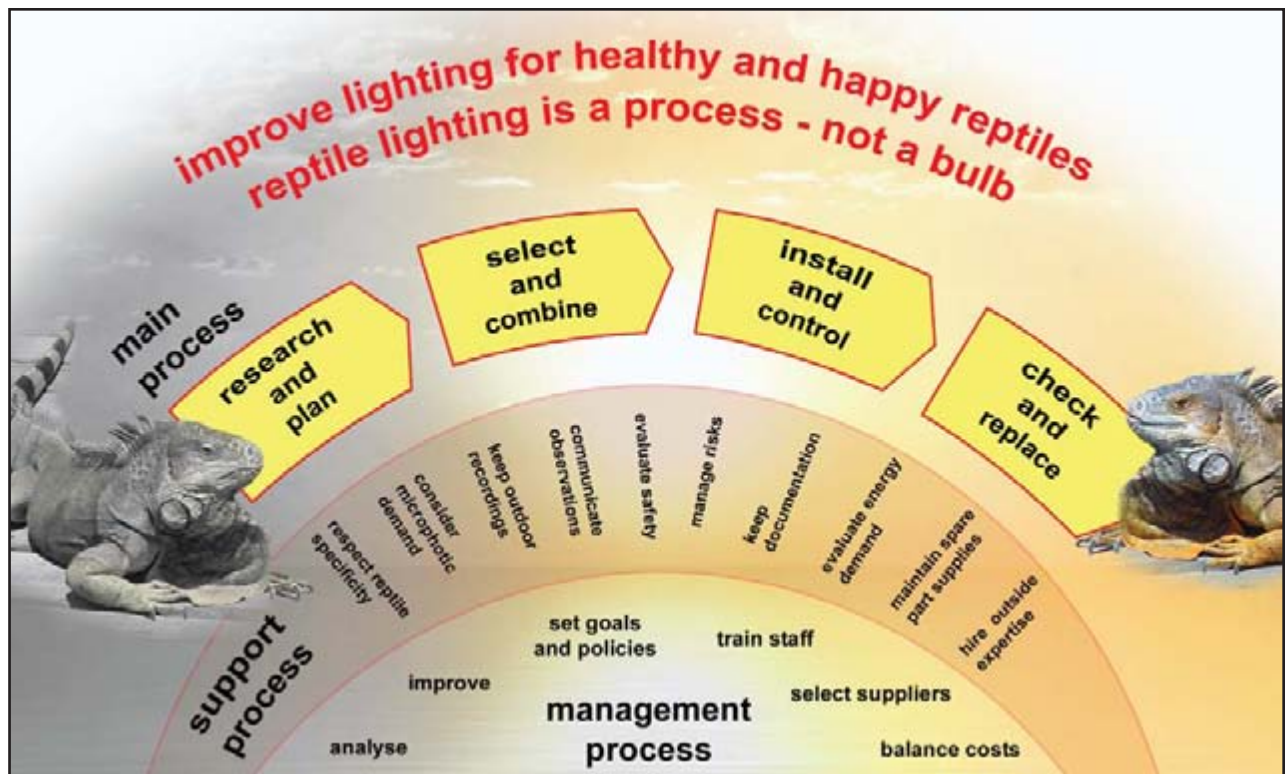


Fig 3. Reptile lighting is a process, not a bulb!



Fig 4. Research about a reptile's habitat and basking behavior is required before its needs can be ascertained.

Research and Plan

The weather and climate of a reptile's country of origin is often misinterpreted as its microhabitat demand. In reality, the actual microhabitat of a reptile varies quite a bit from the reported "climate" for a locality. For example, a reptile that hides in burrows or under shady leaves is going to be exposed to a much different quantity and quality of the radiation spectrum than a reptile that occupies the sunny areas for a particular locale; furthermore, the temperature needs of a reptile may be a distinct entity compared to the lighting needs. For example, one reptile may need cool bright light high in UV-B and another species may do best with hot bright lighting high in UV-B. It

is critical to realize that in captivity, the lighting system must provide appropriate daily and seasonal changes in light and heat (Fig 4).

Reptiles maintain their preferred body temperature behaviorally, keeping a relatively constant body temperature that may be above or below that of their immediate environment. For example, a Gila monster (*Heloderma suspectum*) has a preferred optimal temperature zone of 30°C (86°F), even though the "summer climate" of the Arizona desert may be cooler than that in the morning and hotter by mid-day. This lizard spends a large portion of its time underground in burrows and thus avoids encountering a lot of the sun's radiation; so its lighting needs are different than if it spent many daylight hours above ground.












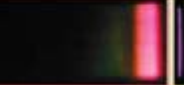


select and combine: lamp categories and the best features currently obtainable within each category							
features which are offered by ONLY the VERY BEST lamps in each category are color-coded thus:			optimal provision		sub-optimal provision	ineffective provision	
lamp category	sun - unfiltered	sun - through glass	incandescent lamp (tungsten filament)	incandescent lamp (tungsten - halogen)	incandescent heat (infra-red lamps and heat emitters)	fluorescent tube	
						non-UVB	UVB
examples							
wattage	3.86×10^{24} w	3.86×10^{24} w	15w - 250w	20w - 500w	25w - 2,000w	15w - 160w	15w - 40w
lumen / watt	93	93	10	25	0 - 3	70	70
lux							
heat		may overheat					
apparent color temperature	1,800K dawn/dusk 5,500K (mid-day) 28,000K (shade and deep blue sky)	as for unfiltered sun	2,600 - 2,850K	2,600 - 3,200K	0 - 1,800K	variable: "very warm white"- 2,700K "skywhite" - 8,000K	variable: range from 6,750 - 47,250K
spectral quality							
CRI (Ra)	99 - 100	99 - 100	99 - 100	99 - 100	N/A	51 - 98	70 - 90
UVA							
UVB	up to 500 $\mu\text{W}/\text{cm}^2$ (mid-day tropics)	0 - 3 $\mu\text{W}/\text{cm}^2$	0	0	0	0	0 - 35 $\mu\text{W}/\text{cm}^2$ at 30cm depending on brand - testing essential
longevity	N/A	N/A	average 3 - 6 mths	average 6 - 9 mths	lamps: 3 - 6 mths heat emitters: >1 year	replace after 1 year for optimum lux	replace after 1 year for optimum lux and UVB

Fig 5. Select and Combine: Lighting Options Assessed.















Ignoring these facts by the keeper leads to a misunderstanding of a reptile's demand and results in chronic under- or over-radiation and distress. Further, each reptile set-up will be different, as each reptile and reptile group has different needs and each keeper has different resources and demands. Lighting has to be planned individually for every terrarium *before* the reptile is acquired!

Select and Combine

Reptiles are adapted to natural sunlight, not artificial light. Because there is no one light bulb that provides the range of radiation comparable to sunlight, one often must combine two or three sources of artificial light in order to create a captive environment suitable for a reptile. It is particularly important to provide an appropriate intensity of light across the full spectrum, including ultraviolet light. To facilitate normal basking behavior and achieve an illumination and thermal gradient, it is important to focus all radiation (UV, visible light and infrared) upon the same area.

Relevant Parameters

- **Watt:** energy consumption/time (i.e., what you pay as electric power bill)
- **Lumen:** total emitted visible light radiation as apparent to a human observer
- **Lumen/watt:** light efficiency; the humanly visible light output per watt lux: lumen received at 1 m² (i.e., the illumination or light intensity received)
- **(Apparent) color temperature in Kelvin (°K or K):** subjective redness or blueness of a light source; the hue of light as seen from a theoretical black body radiator with corresponding Kelvin; this is a problematic unit with lamps having interrupted spectra and when considering light filtered through green leaves in some reptile habitats. spectral quality: spectroscopy images reveal the potential level of similarity to the solar spectrum
- **Color Rendering Index (CRI):** indicates the ability of a lamp to reproduce the natural "true" colors of various objects to a human observer
- **Longevity:** estimates based on the lamp being in use for 10-12 hours per day (Fig 5).

select and combine: lamp categories and the best features currently obtainable within each category							
features which are offered by ONLY the VERY BEST lamps in each category are color-coded thus:				optimal provision	sub-optimal provision	ineffective provision	
lamp category	compact fluorescent		mercury vapour			metal halide	LED
	non-UVB	UVB	non-UVB	UVB self ballasted	UVB externally ballasted		
examples							
wattage	9w - 250w	9w - 26w	50w - 1000w	100w - 300w	60w	35w - 2000w	1w - 3w
lumen / watt	50	50	20 - 30	20	30	70	>100
lux							
heat							
apparent color temperature	variable: "very warm white" - 2,700 K "daylight" - 6,500K	variable: range from 6,000 - 9,850K	3,000K	variable: range from 4,500K - 8,700K	6,800K	variable: range from 2,900K - 20,000K	variable: "warm white" - 3,000K; "cool white" - 10,000K
spectral quality							
CRI (Ra)	51 - 98	64 - 76	74	8 - 55	12	65 - 93	64 - 80
UVA							
UVB	0	0 - 35 µW/cm² at 30cm depending on brand - testing essential	0	0 - over 2,000 µW/cm² at 30cm depending on brand - testing essential	150 - 200 µW/cm² at 30cm (only one brand currently available)	0 (brands emitting UVB are being developed - testing will be essential)	0
longevity	replace after 1 year for optimum lux	replace after 6 mths for optimum lux and UVB	ext. ballasted: >1 year; self ballasted: 6mths	average 6 mths; replace after 1 year for optimum UVB	replace after 1 year for optimum UVB	> 1 year	> 1 year

The similarity table features the main categories of light bulbs used in reptile husbandry. Color coding highlights features that are similar to the natural sun that are available from only the best lamps in each category. Whether the bulbs are standard or produced specifically for reptiles, these vary widely in performance (Fig 5).

UV-B lighting is particularly problematic because keepers cannot assess the UV-B output of a lamp without a suitable meter. Few independent test results are available; those that have been published show that some "reptile" UV-B products are of high quality whereas others may even be detrimental. The output level of UV-B bulbs should be measured or referred for unbiased test results. Since output declines with time, regular measurements may reveal a bulb that needs to be replaced before the 6-12 month window that is commonly stated as the useable lifespan of a UV-B bulb.

Selecting and combining suitable lamps enables optimization of the quality of the spectrum, the

intensity of light and heat and the UV-A and UV-B levels provided in each terrarium.

Install and Control (Fig 7)

To avoid glare affecting the eyes of the terrarium inhabitants, lamps placed inside or outside the enclosure must be positioned above the reptile at the calculated optimum distance. Lamps must be positioned eccentrically in the vivarium to allow an illumination and temperature gradient to develop. Regular glass and most plastics will completely block UV transmission; even mesh will reduce it significantly. Any of these substances positioned between the light and the reptile will also reduce the intensity of visible light. Reflectors may be used to focus radiation and increase its intensity.

Control of the lighting involves various electrical equipment, such as insulated wires, sockets and mounting fixtures. These devices must be suitable for the power source and for the wattage of the lamp and must be heat-, water- and corrosion-resistant. If the

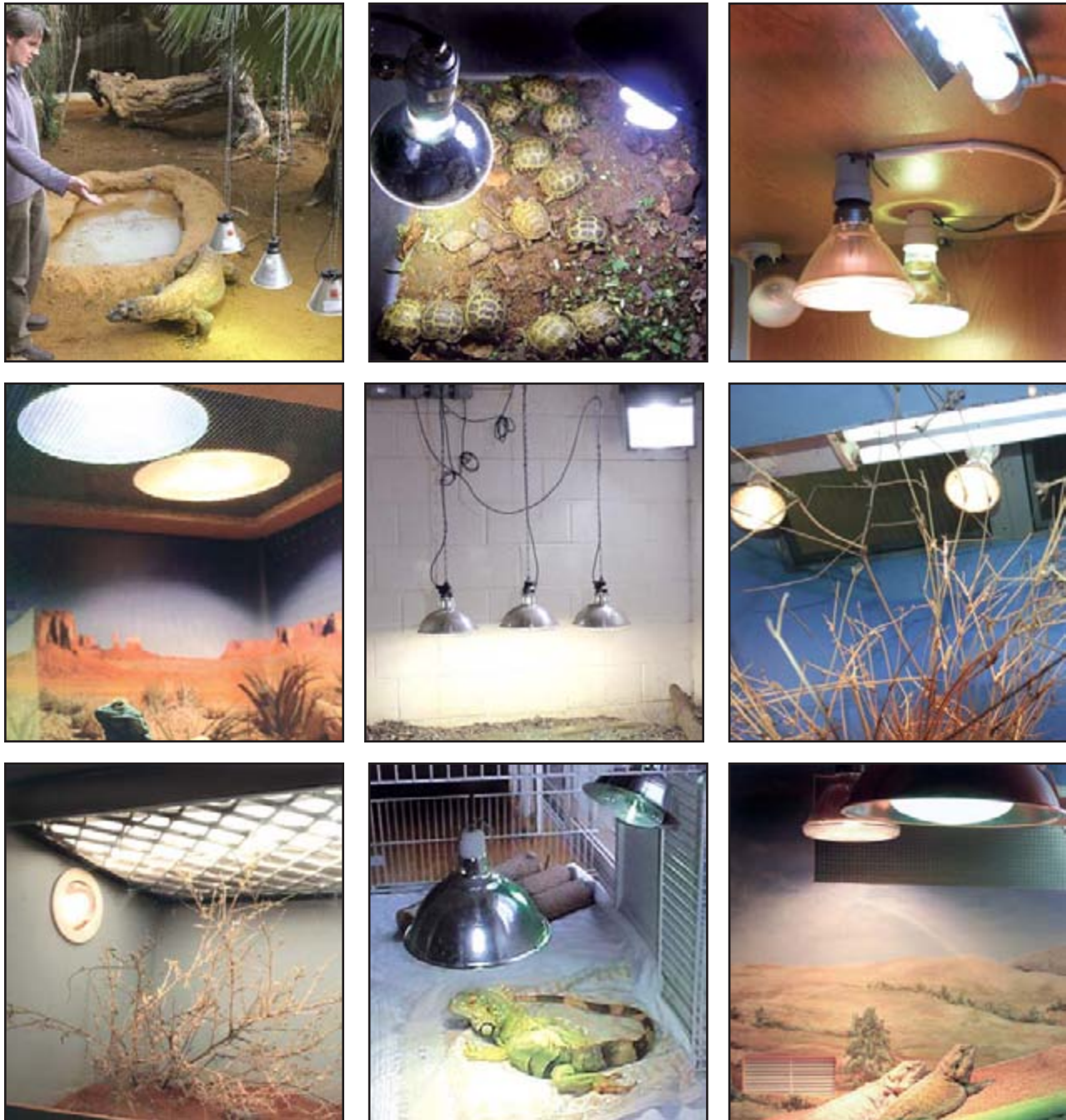


Fig 6. Select and Combine: Examples of successful “mixed lighting” providing a more balanced spectrum within individual habitats.

reptile can access the devices, the lamps also must either be shielded from direct contact or of such design as to be impervious to the reptile’s destructive capabilities.

Residual current devices should be fitted as appropriate. Low voltage installations enhance electric shock safety but don’t reduce the risk of fire hazards. If the light bulb or other device, such as a ballast for fluorescent lighting, gets hot, it can be a source of thermal injury to a reptile if not suitably shielded. Protection against accidental burns is particularly

important. Even fluorescent bulbs get hot! Mesh guards should be used where appropriate, allowing for their impact on transmittance of the key wavelengths of light for the reptile in question. Consider the use of electronic controls to regulate temperature and the timing of diurnal lighting; these last longer than mechanical timers. Computer-controlled systems may even enable sophisticated simulation of natural daylight hours, seasonal changes and weather, and take into account variation of the outside solar radiation.



Fig 7. Install and Control: Safety equipment and thermostatic control of heat and light is essential.

Check and Replace (Fig 8)

Wires and contacts must be serviced, checked for defects and renewed regularly. Some types of lamp need regular monitoring because their UV-B and lumen output decays along specific parameters; these may have to be replaced earlier than at the point of their maximum lifetime. Reptile veterinarians “take a herp’s temperature” by monitoring their simulated solar habitat. Simple hand tools that measure local parameters and decay of bulb radiance include:

- **thermometer** (electronic wired or infra-red non-contact)
- **lux meter, UV-B and UV-A meter**
- **digicam** as luxmeter and for apparent color temperature estimate

However, no tool can replace the careful and conscientious observer who is cognizant of the normal appearance and behavior of a healthy captive reptile.

Support Process

Provisions should be made for a back-up emergency power supply. Reserve equipment should be kept in stock to instantly replace devices that fail, especially since many products used can be acquired only from specialty shops or internet dealers. Documents and manuals for equipment and bulbs should be filed and accessed to answer questions—read the manual and don’t trust your memory when dealing with complicated electrical systems. Adequate insurance and professional technical assistance are advisable. Lastly, fire safety is a must. A combination of smoke detectors and alarms is essential for the safety of the captive reptiles as well as the humans that share the same building.

The knowledge of reptilian illumination requirements and the designs for providing appropriate lighting for captive reptiles is continuously growing.



Fig 8. Check and Replace: Regular monitoring of all heating and lighting is not difficult with modern meters recording light and UV-B levels as well as temperature.

The veterinarian is encouraged to use media and communities (local and worldwide) to stay up to date and share knowledge. All changes to husbandry practices and the resulting successes and failures should be recorded; care should be taken to separate anecdotes from documented and statistically valid observations that are repeatable.

Management Process

As a facility manager, reptile curator or consulting reptile veterinarian, goals and policies should be set and communicated to the staff. Research, observation and feedback are essential to analyze and improve the reptile lighting process. The private reptile hobbyist should have a safety net of friends who can help care for their collection in the event they are incapacitated.

Conclusions

Most ill health in captive reptiles is the result of poor husbandry, often provided by well-meaning but ill-informed keepers. Reptile veterinarians must be knowledgeable on designing and assessing lighting systems used for captive reptiles since they are a powerful force that can positively or negatively influence a reptile's immune-neuro-endocrine network. Critical anthropomorphism can be used to teach a keeper a "feeling for reptiles." For example, it is helpful to ask people to imagine reading a color magazine under dim red lighting to help them understand how critical adequate, full spectrum light is for reptiles. Ultimately, one must remember that reptile lighting is a process...not a bulb!

Further Information

1. www.qmvet.de/rept_light_immune_lit.pdf
2. www.qmvet.de
3. www.uvguide.co.uk
4. www.reptileuvinfo.com





How to Make a Fish Anesthetic Machine with Divided Recirculation Circuits

Nimal Fernando, BSc, BVSc (Hon), MACVSc (Diagnostic Imaging, Avian Health); Walter Tang and Wendy Chan, RN



Nimal Fernando, BSc, BVSc (Hon), MACVSc (Diagnostic Imaging, Avian Health)
Ocean Park Corporation
Aberdeen, Hong Kong
nimal.fernando@oceanpark.com.hk

Nimal Fernando is a graduate of The University of Queensland, Australia. For the last 7 years he has been working in Hong Kong with exotic species. His current position is at Ocean Park, an oceanarium with a large and varied collection of animals including fish.

Fish anesthesia usually involves the use of immersion baths or, for longer procedures, non-recirculation or recirculation systems.¹⁻³ The recirculation systems described in the literature allow control of anesthetic depth only by the movement of the fish or hardware back and forth to a second recirculation system, usually containing anesthetic-free water.

The Hong Kong Ocean Park fish collection is substantial and diverse. Previously when fish anesthesia was required, the various components (pump, tank and holding tray) were quickly assembled to create a temporary device. However, we believed we would undertake more frequent and lengthier procedures with a dedicated machine designed to accommodate the variety of fish patients in the collection. With this in mind, a project emerged to produce a machine that accepted a variety of fish sizes, allowed some control of anesthetic depth and was still simple to operate. The resulting fish anesthetic machine allows control of anesthesia by creating two separate recirculation systems, which enables the anesthetist to adjust the anesthetic depth without moving the fish or hardware.

The purpose of this article is to describe the design and underlying principles of this fish anesthetic device so that similar units may be constructed by others. The materials used in the final construction of the machine are readily available in hardware and aquarium stores so the anesthetic machine can easily be constructed by the veterinary practitioner in collaboration with a workshop for the acrylic tank if needed.

Design and Construction

The starting point for the project involved the use of cardboard boxes (Figs 1, 2) to help conceptualize the design. The basic physical requirements for the system included a partitioned tank and interchangeable troughs of different sizes to hold fish. Then we determined how to connect the pipe work and pump in such a way that a separated recirculation system could be created.

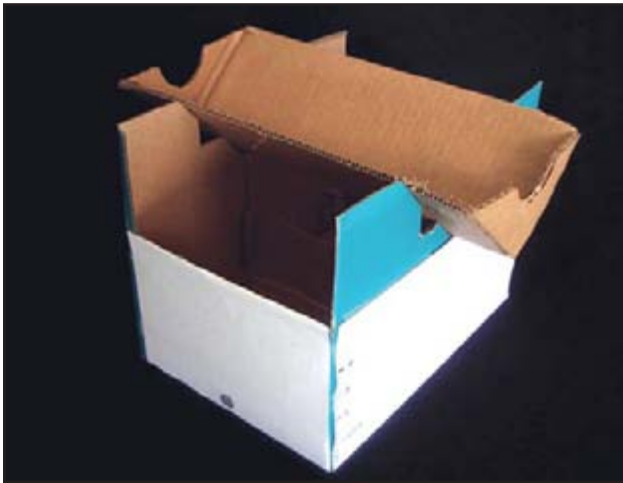


Fig 1. Cardboard boxes were helpful in designing and conceptualizing the machine prototype.



Fig 2. After proposing to divide the main tank to separate the water, the next concept was to design interchangeable troughs to hold fishes of varying sizes.



Fig 3. A small fish anesthetic machine was created from the design. The anesthetized fish patient is positioned in a trough and supported by sponges. By the opening and closing of taps, water is drawn from one of two recirculation systems, allowing the anesthetic depth to be regulated without moving the patient or pump.



Fig 4. A dye illustrates the partitioning of the main tank. This partition separates water containing anesthetic from water without anesthetic.

minimal cost (approximately \$3000 HKD for the small unit and \$4000 HKD for the larger unit, or US \$385-513). Assembly of the PVC pipes, taps and pump was

performed in-house with material and equipment sourced from aquarium and hardware stores.

Operating the Anesthetic System

The main tank is separated by a partition with one side designed to hold the anesthetic-containing water and the other side anesthetic-free water. Figure 4 illustrates the partitioning of water by the addition of a dye. In this setup, the letter “A” designates the side holding water with the anesthetic agent.

The main tank can also be used for inducing anesthesia (Fig 5), and a volume scale was added to the side of the tank to aid in anesthetic dosing. An induction dose can be reduced to a maintenance level by the appropriate releasing of anesthetic-containing water and refilling with anesthetic-free water. For larger fish, the overlying trough can be lifted off for induction, increasing access to the fish.

The holding trough retains the fish in position (Fig 6). Foam sponges and towels are used for further stabilization as dictated by the body conformation of the fish. Water returns to the appropriate side of the main tank by a ventral drainage hole in the trough connected to PVC pipes. The trough is angled slightly to facilitate drainage.

A larger unit modeled on the smaller unit was built to accept a series of different-sized troughs to hold larger fish (Figs 7, 8). The volume of recirculating water supported by the tank reservoir was determined to be sufficient to maintain anesthesia (Fig 9). The troughs are easily removed from the tank after disconnecting the PVC piping (Fig 10).

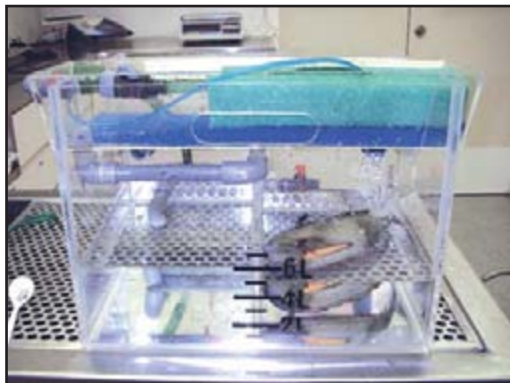


Fig 5. Induction of anesthesia in the main tank is shown. A volume scale on the side aids in anesthetic dosing.



Fig 6. Sponges in the trough protect the fish from mechanical damage and help to keep the fish wet. They also facilitate positioning, which is especially helpful in laterally compressed fishes.



Fig 7. The large anesthetic machine is shown with the smallest trough in place.



Fig 8. The large anesthetic machine holds a trough in place for use with the largest fish species.

The pump used in the initial small unit is an Eheim® pump with an output of 5 L/minute. The larger unit is fitted with an Eheim® pump with an output of 38 L/minute.

The pump drives the water flow but the configuration of pipes and taps directs water through the anesthetic machine and enables the operation of two recirculation systems. Figure 11 illustrates the cycle of water through one recirculation system. Water is drawn by the pump into the system at the intake valve, moves to the fish and then empties into the trough. From here it returns to the same side of the tank, completing the recirculation. Note the position of the taps that open one system and close the other. Switching between the 2 systems requires the operator to reverse the open and closed position of the taps.

In switching between the 2 solutions, there is some "dead space" in the trough and pipes that retains water from the previous function. To minimize assimilation of the 2 and avoid delivery of the passive solution, the taps to the first operating circle are closed for a few seconds to allow the system to clear prior to opening the alternate circle.

At the fish intake the tubing is split into 2 different diameter hoses (Fig 12). By providing variable resistance, a tap (Fig 13) is used to regulate the relative flow to the 2 tubes, one delivering the anesthetic

while the other is used to wet the fish.

A drainage pipe from the pump facilitates emptying of the tank, which is especially useful for large volumes of water (see Fig 10).

When operating the anesthetic machine a residual current device should be used for personal safety. This will provide protection against electrical shock should any current leakage occur.

Experiences in using the new machine have been positive and have produced consistently good results, although the final design outlined here was the result of several modifications made after trial use. Initially an air line was attached to the pump to oxygenate the water but during switching between the solutions, we found it drew air into the water column and stopped the pump. Oxygen levels appear to be adequate by relying on turbulence generated through the machine. We also raised one end of the trough to facilitate drainage and return of water to the reservoir tank. This is particularly important when switching between solutions to minimize assimilation of water between the 2 recirculation systems.

Figures 14-16 illustrate various diagnostic procedures being performed using the small and large unit. Future plans include designing a trough to accommodate rays.



Fig 9. The use of PVC pipes, taps and pump in the large unit are based on the same principles as for the smaller machine.

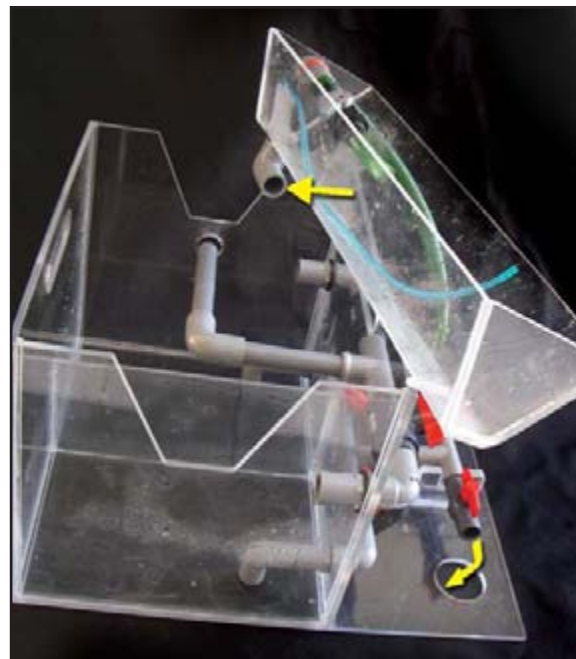


Fig 10. Troughs are selected based on the size of the fish patient and can be interchanged easily by disconnecting the PVC piping (straight arrow). A drain port facilitates rapid emptying of water (curved arrow).

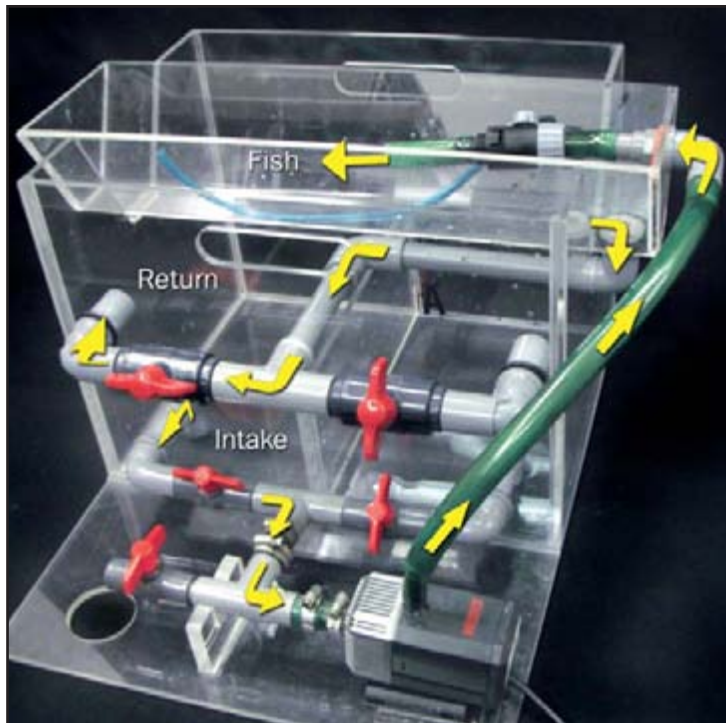


Fig 11. Shown is the water flow of one recirculation system.



Fig 12. Close-up showing how hose is split before delivery of water to the fish.



Fig 13. Based on the size of the fish, one hose can be directed into the mouth to maintain anesthesia and the other is used to wet the fish.

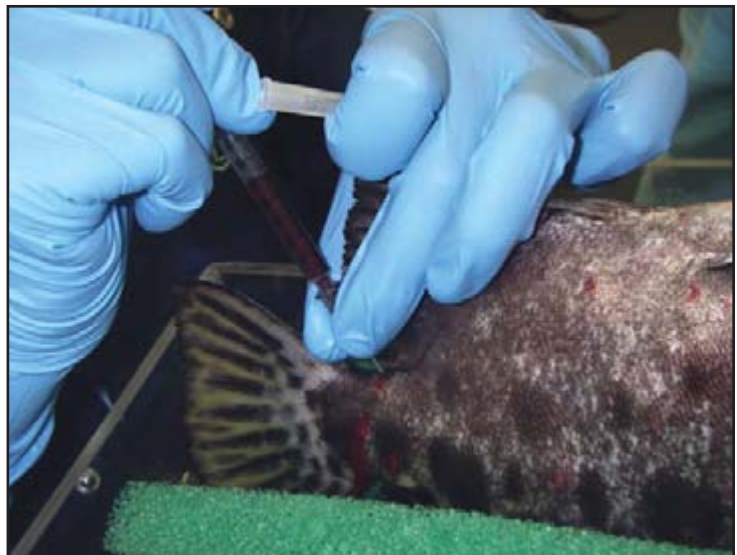


Fig 14. Blood is collected with the patient under anesthesia.



Fig 15. A wolfish is anesthetized to obtain skin biopsies. Ice was added to the water to maintain the appropriate temperature range during the procedure.



Fig 16. A mass is excised from the head of an ornamental goldfish using electrosurgery.

Acknowledgements

This project was funded by Ocean Park Corporation, Hong Kong. The authors would like to acknowledge the advice and assistance of Paolo Martelli, Yoyo Szeto and Matthias Hoffmann-Kuhnt.

References and Further Reading

1. Ross LG: Restraint, anaesthesia and euthanasia. In Wildgoose WH (ed): BSAVA Manual of Ornamental Fish 2nd ed. Quedgeley, UK, BSAVA, 2001, pp 75-84.
2. Brown LA: Anaesthesia and restraint. In Stoskopf MK (ed): Fish Medicine. Philadelphia, WB Saunders Co, 1993, pp 79-90.
3. Lewbart GA, Harms CA: Building a fish anesthesia delivery system. Exotic DVM 1(2):25-28, 1999.
4. Harms CA: Fish. In Fowler ME, Miller ER (eds): Zoo and Wildlife Medicine 5th ed. St. Louis, W B Saunders Co, 2003, pp 2-20.



JOIN THE DISTINCTIVE PROFESSIONAL ORGANIZATION FOR AVIAN PRACTITIONERS

- Quality educational publications and programs
- Opportunities for comradeship and networking
- Chance to impact avian conservation and research



**Association of
Avian Veterinarians**

PO Box 811720, Boca Raton, FL 33481-1720
561-393-8901 fax 561-393-8902
aavctrlofc@aol.com

Advancing and Promoting Avian Medicine and Stewardship

DO YOU HAVE AN UNUSUAL CASE?



WE DO IT ALL — FROM THE USUAL TO UNUSUAL.

ZOO/EXOTIC PATHOLOGY SERVICE

SINCE 1984

Drury Reavill, DVM, DACVP, DABVP (Avian Practice)
Robert Schmidt, DVM, PhD, DACVP

FED-EX SHIPPING AVAILABLE

(800) 457-7981 • Fax (916) 725-6155 • www.zooexotic.com
Shipping Address: 2825 KOVR Dr, West Sacramento, CA 95605





Manfred and Claudia Hochleithner



It all started with an ordinary tourist visit by Manfred and Claudia Hochleithner to Rwanda to photograph the mountain gorillas. Mountain gorillas are one of the most endangered species in the world, with only 2 small populations left: a group of 350 in Uganda and about 380 individuals in the Parc National des Volcans (National Volcano Park) in Rwanda. In contrast to lowland gorillas, the mountain gorillas do not thrive in zoos because of their specific dietary needs.

After their visit, the Hochleithner's returned

to their small animal/exotic practice in Vienna and couldn't get the gorillas' plight out of their minds. Now, several years later, they have come to realize that they can best help the mountain gorillas by supporting the people of Rwanda.

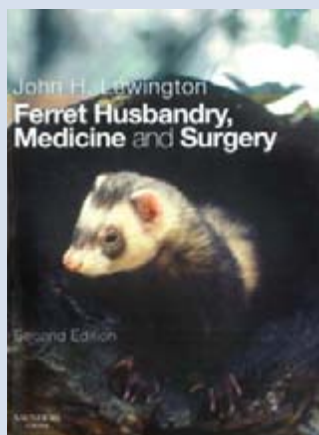
They have established NSO (non-profit) Endangered, an organization whose current projects include:

- Medical support for the human hospital (basic needs, such as gloves, needles and syringes)
- Education of rangers (scholarship for training one ranger a year)
- Water cisterns (build at least one per year)
- Support a small community of pygmies who were displaced from the park
- Create the Rwaza Orphanage. Due to the high incidence of HIV and aftermath of the genocide 10 years ago, there are many orphans with no chance for an education. Together with local authorities and the parish of Rwaza, Endangered has built an orphanage for 52 children, called

Hope for the Children, along with an educational center and library.

The overall goal of Endangered is to teach the community the advantages of conservation and natural parks, so they can decide for themselves to save the unique environment they have with the National Volcano Park.

Endangered depends on donations, 100% of which are used only for Rwanda projects. A gift of 300 euros (\$425) will provide one year of secondary school for a child or one month of food for all 52 children. In addition to fund-raising events sponsored by the Hochleithner's, such as the annual "Night of the Gorillas" held at the Museum of Natural History in Vienna, national and international partners (SN Brussels Airlines, Bayer AG Austria, Royal Canin Waltham, Allianz Versicherung and the Parish of Rwaza) help support their goals. Tours are also available to visit the park and the community. For further information, contact Endangered: info@endangered.at, www.endangered.at



ISBN: 978-0-7020-2827-4

2007

528 pages, softcover

\$110

Saunders Elsevier, Edinburgh

Order fulfillment: Saint Louis, Missouri

800-545-2522

www.elsevierheath.com

Ferret Husbandry, Medicine and Surgery 2nd Edition

Edited by **John Henry Lewington**, BVetMed, MRCVS

John Lewington's experience as a veterinarian and ferret owner combined with leadership of numerous ferret groups, culminate in a book to "bridge the gap between ferret owner...and the veterinarian."

+ On the Plus Side

The color pictures in the book are helpful, especially when describing handling techniques, starting hospital equipment and housing ideas. The writing is chatty and makes for an easy read. Each section includes a wide variety of topics, leaving few internationally emerging diseases or toxins not well covered. Toxins alone cover 19 different sources in good depth. Newly characterized in 2003, disseminated idiopathic myositis receives a timely description, along with genetic predisposition for endocrine tumorigenesis. The chapter on feeding presents a well-thought-out and referenced discussion of feeds and feeding options.

• On the Minus Side

Unfortunately, the chatty tone, non-intuitive layout and scant index make it very difficult to quickly look up a disease or treatment if you have an ill ferret or you do not already suspect a diagnosis. Ultrasound is covered in the medical section, though endoscopy is orphaned in the hospital equipment section. Vaccine reactions (not in index) are embedded in the distemper virus section. Pain management is limited and does not include non-steroidal anti-inflammatory dosing. The case examples are helpful descriptions, but may not include dosing used.

The surgical section is rather small compared to the rest of the book with only 28 out of 500 pages for general surgery, orthopedics, and cryosurgery combined.

Several chapters are redundant, and by chapter 6, a second lengthy discourse of how long the ferret has been domesticated feels

out of place, even if colored by Aesop references.

The color pictures so prominent in the husbandry section are missing in the surgical section; fecal parasite life cycles are included, but no fecal parasite photos. The dental section includes numerous skull pictures and eruption descriptions, but no x-ray results.

The reproductive hormone section was disappointing, with estrogen toxicity not included in the index and receiving only a brief description buried in anemia (also excluded from index) rule-outs. The author has seen only a single case of adrenal disease and lists mitotane as the primary therapy followed by a very wide range of therapies offered from deslorelin to tamoxifen to melatonin to control the excessive sex hormones. But, the conclusion states "untreated ferrets with adrenal disease...would benefit from anabolic steroids" (364).

Some other conclusions are unexpected: "...should be safe to feed poisoned possums if the head and feet are cut off so that no residual poison remains" (74). Selamectin (Revolution®) is incorrectly listed as unavailable in the USA instead of the recalled Proheart® (moxidectin).

Add to Bookshelf?

Veterinarians will find an excellent husbandry and breeding resource with thorough medical rule-out lists, internationally aware rule-outs, current advancements and the depth of unusual diseases helpful and unique to this book. The scattered and difficult-to-reference sections, disproportionately small medicine and surgical section, weak index, lack of prioritizing into common and rare, preclude it as a stand-alone or primary reference.

Reviewed by **Kristen Love**, DVM
Lewis Center, Ohio



Flynn's Parasites of Laboratory Animals Second Edition

Edited by **David G. Baker**, DVM, MS, PhD, Dipl ACLAM

This second edition comes more than 30 years after the first, with the same purpose of providing a readily accessible and comprehensive resource on the parasites of species commonly used as laboratory animals. This is a rather hefty volume at over 800 pages and is certainly not superficial treatment of the subject. It is basically set up as a good review and reference text. Photographs and illustrations are all in black and white.

➕ On the Plus Side

The similarity of organization of each host chapter makes it easy to develop a method to use this large text. The tables at the end of each host chapter present information based on the host organ system and help direct the reader to more detailed references for each parasite.

The best chapter overall was the one on rats and mice, which was important because the chapters on hamsters and gerbils refer back to it frequently. The text was carefully edited to maintain the same style throughout the book by different contributors.

➖ On the Minus Side

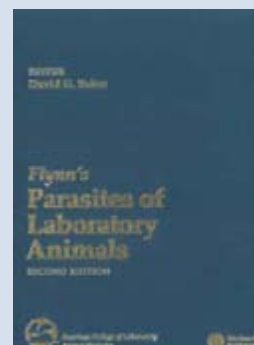
This is a true parasitology reference text and therefore is not for those who want a handy dandy picture book or a quick differential clinical reference book. Some chapters, such as those for amphibians, reptiles and guinea pigs, would have benefited from more photos, as would the usefulness of the overall text.

📖 Add to Bookshelf?

Although this is not a book to use as a quick guide or a clinical differential, it is a good investment as a comprehensive reference text if: 1) you have an interest in parasitology, especially of laboratory

animal species; 2) you are dealing with a commercial operation, such as a producer or distributor of any of these species; 3) you are a practitioner who sees these species on a fairly regular basis as pets. Personally, I find this book is the perfect complement to my other reference texts for laboratory animal medicine and surgery. I may not pull this book out every day, but I know exactly where I'll start looking up information on laboratory animal parasites when I need to.

Reviewed by **Carol Lynn Yeisley**, VMD
Fleetwood, Pennsylvania



ISBN: 9780813812021

2007

816 pages, hardcover

\$149.99

Blackwell Publishing Professional

Ames, Iowa

800-862-6657, fax 515-292-3348

www.blackwellvet.com

USI SUPER-CUT SCISSORS

**One blade serrated, one blade super-sharp.
Gold handles for easy identification.**



**Great for
wing clipping!**



**\$18 ea. or
3 or more
for \$15 ea.***

- Mayo 5.5" or 6.75" straight or curved
- Metzenbaum 5.5" or 7" straight or curved
- Operating Scissors 5.5" s/s or s/b straight
- Stitch Scissors 3.5" or 4.5"
- Lister Bandage Scissors 3.5", 4.5", 5.5" or 7.25"
- Hi-Level Bandage Scissors 3.5" or 5.5" angled
- Knowles Bandage Scissors 5.5" straight
- Also available without gold handle:
5.5" Hi-Level @ \$10.00 or
7.25" Hi-Level @ \$12.00

*Offer expires September 2007



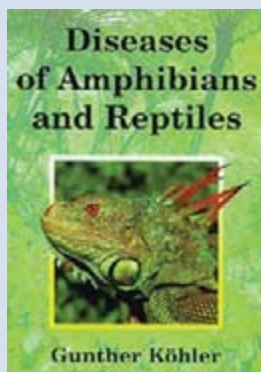
Universal Surgical Instruments
10 Valley Road, Glen Cove, NY 11542

1-877-587-6278

1-516-759-4536

www.universalsurgical.com

***Mention this ad to receive FREE ground shipping when ordering these items.**



ISBN: 1-57524-255-9

2006 English edition, 184 pages

\$37.50

Krieger Publishing Company

PO Box 9542, Melbourne, Florida

800-724-0025, 321-724-9542

www.krieger-publishing.com

Diseases of Amphibians and Reptiles

By **Dr. Gunther Köhler**, translated by Valerie Haecky

The author is a veterinarian and curator of the Research Institute and Natural History Museum Senckenberg in Frankfurt/Main, Germany. The purpose of the book is to educate practitioners who are presented with sick reptiles and amphibians as well as to disseminate information on disease prevention to keepers of these animals. It is meant to discuss the most common and relevant diseases in a brief, quickly reviewable fashion.

+ On the Plus Side

This book provides a good basic review of common disorders and introduces basic reptile medicine concepts. Clear and high-quality photographs are scattered throughout the text.

Much of the information is well documented. The appendices include an overview of viruses, some clinical pathology normal reference ranges, a glossary (which appears to be aimed toward the layperson) and a list detailing some nutritional analyses of food.

• On the Minus Side

Many of the topics were discussed in a superficial manner. Anatomic diagrams are fairly simplistic and do not elaborate on much of the anatomy details. The index is limited to a few pages. There is no central list of medications and dosages found useful by the author except for a short list of antibacterial and antifungal drugs. A number of medications have limited availability outside of Germany.

Unfortunately, the author also often provides only brand names without a more generic description of the product in the text.

The description of diseases and therapy in amphibians is very short; one seeking more "meat" on amphibians should review other references. There is more of an emphasis on a "list of diseases" rather than discussing diseases from a case-analysis standpoint (i.e., compiling a list of differential diagnoses for a case). Causes of changes in clinical pathology are also poorly discussed.

• Add to Bookshelf?

There are other reptile references that I would access first for thoroughly detailed medical information. But this reference has enough attributes to warrant investment by a veterinarian who is occasionally called on to see a reptile patient, or by a herpetoculturist wanting to broaden his/her education, or by a veterinarian regularly seeing reptile patients who wants to have an additional source covering possible deficiencies in other texts.

Reviewed by **Vanessa Rolfe**, DVM
Greenacres, Florida



Increase Your Revenue, Increase Your Service



**More than 6,000 US
veterinarians have selected
the AVID system.**

- Provide safe, effective and permanent identification for your clients' pets
- Improve record keeping
- Simple injection procedure without anesthesia
- Offer your clients' pets increased protection through a national registry

AVID

AMERICAN VETERINARY IDENTIFICATION DEVICES

800-336-2843

www.AvidID.com

fax 951-737-8967 PETrac@avidid.com
3185 Hamner Ave, Norco, CA 92860

em exotic marketplace

YOUR EXOTIC RESOURCE BULLETIN BOARD

Rabbit/Chinchilla Table Top Stand

Universal Surgical Instruments offers the Rabbit/Chinchilla Table Top Stand at a discounted price. This device allows the mouth to be held open without assistance. The platform is adjustable to various heights. As recommended by Dr. Capello. Call and order yours today at 877-587-6278 or 516-759-4536.



Universal Surgical Instruments
10 Valley Road,
Glen Cove, NY 11542
sales@universalsurgical.com
<www.universalsurgical.com>



New Induction Hoods for Avian and Exotic Species

- Saves anesthetic
- 3 sizes - parakeet, cockatiel, macaw
- Hoods for long-billed species available
- Removable and washable skirt
- Endotracheal tubes also available (down to 1 mm)



Medical Engineering and Development, Inc.
800-784-9060, 517-780-9805
<www.med-engr.com>

Avian Publications Avian Veterinary Books

The Complete Pet Bird Owner's Handbook by Dr. Gary Gallerstein revised and updated. 441 page hardcover. **\$34.95**

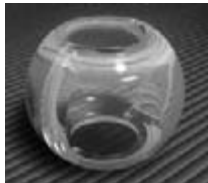


Check our website for all your Avian Veterinary Medicine book needs. Shipping worldwide.

Avian Publications
6380 Monroe St NE, Minneapolis MN 55432 USA
Phone/Fax Orders: 800-577-2473
<www.avianpublications.com>

Avian Spherical Collar

A unique restraint collar. **Order online now:** www.aviancollar.com or call 239-267-9746



Digital X-Ray System For Exotics

Now Replace all your X-Ray films with easy to use High Quality Digital Images! Our New Exotic Digital X-Ray Navigator eliminates the inconvenience and high costs associated with film usage.



SAVE TIME, MONEY AND SPACE!

Diagnostic Imaging Systems, Inc.
800-346-9729, joe@vetxray.com
<www.vetxray.com>

Crickets! Crickets!

- Size: pinhead, 1/8", 1/4", 1/2", 3/4" and adult
- Mealworms, superworms or waxworms cupped or bulk
- Cricket supplies available
- Guaranteed live delivery



Buy direct from **MILLBROOK CRICKET FARM**.
800-654-3506 or <www.millbrookcrickets.com>.

Skip's Pharmacy COMPREHENSIVE SPECIALTIES

Call for Your All Breed Rescue Book
Extensive Veterinary Inventory

At Skip's Pharmacy,
specialized pharmacists prepare
medications utilizing patient
specific dosing in unique delivery
systems to achieve optimal
therapeutic outcomes.

1.800.553.7429
www.Skipspharmacy.com
21000 Boca Rio Rd. Suite A-11 Boca Raton, FL 33433

Are You Looking for Medicated Beads (PMMA)?

Liberty Drugs is offering medicated beads (PMMA) with Cefazolin and Amikacin that are microbiologically tested.



- The available sizes are 5 beads, 10 beads and 25 beads per package. They are priced at \$10, \$25 and \$45 accordingly.
- We also compound medicated gel that can be infused instead of using beads. Medicated gel will stay in a body for 7-14 days. Dissolves completely and makes the procedure less invasive.

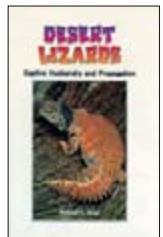
LIBERTY DRUGS

109-19 Liberty Avenue, Richmond Hill, NY 11419
call us toll free with all questions (877) 733-5533
and ask for Simon Lorberg, RPh, FACVP

Quarterly Sale – Save 50%

Offer Expires 04/01/08

DESERT LIZARDS: Captive Husbandry and Propagation
by Randall L. Gray
Orig. Ed. 2003 • 144 pp.
ISBN 1-57524-160-9



Regular Price \$31.00
With this ad **\$15.50**
plus shipping

Krieger Publishing Company - Dept. 8151
P.O. Box 9542 • Melbourne, FL 32902-9542
800-724-0025 • Fax: 321-951-3671
e-mail: info@krieger-publishing.com
<www.krieger-publishing.com>

Unopette® Replacement

The new Avian Leukopette replaces the discontinued Eosinophil Unopette® for performing total WBC in birds. The kit, which consists of 50 prefilled tubes containing 1% phloxine, 25 µl Minipet® and disposable tips, is available for \$67.50. Phloxine solution, empty



tubes for filling and pipettes can all be purchased separately. Contact Vetlab Supply, 800-330-1522, 305-253-1848 or DrVetlab@vetlab.com.

Special VJ Index Offer

The Veterinary Journal Index (VJI) citation database contains over 80,000 veterinary reference citations (author, title, journal information and summary) from the 1970s to present. The strongest portion of the VJI is the Avian and Exotic section, which can be ordered separately and is available as an introductory offer to Exotic DVM readers for \$49. Contact Marty Page, 800-627-2297, marty@vjindex.com or www.vjindex.com.

Avian Handfeeding Spoons

Special spoons that can be attached to standard syringes are available for handfeeding of young



or injured birds. The spout of the spoon allows a predetermined amount of food to be deposited directly into the bird's mouth. Refilling the syringe rather than spoon reduces the risk of cross-contamination. For further information contact Meadow's Animal Healthcare, Loughborough, Leicestershire, England,

www.meadowsanimalhealthcare.co.uk.

Exotic Animal Artwork

Les Sealing, the artist who created the avian anatomy overlay as part of the Avian Medicine: Principles and Application book, announces the availability of exotic animal artwork and skeletal Giclee prints for clinic reception areas and examination rooms. He is also available as an



illustrator for pet portraits in various media. For a catalog or further information, contact Sealing Illustration, 303-762-0270, sealingillustration@comcast.net or www.sealingillustration.com.

STATEMENT OF OWNERSHIP, MANAGEMENT AND CIRCULATION

1. Title of Publication: EXOTIC DVM Veterinary Magazine. 2. Publication No.: 1521-1363. 3. Date of Filing: October 24, 2007. 4. Frequency of Issue: Quarterly. 5. No. of Issues Published Annually: Four. 6. Annual Subscription Price: \$69 US/\$89 International. 7. Complete Mailing Address of Known Office of Publication: 2324 S. Congress Ave., Suite 2A, West Palm Beach, FL 33406. 8. Complete Mailing Address of Headquarters of General Business Office of Publisher: PO Box 541749, Lake Worth, FL 33454-1749. 9. Full Names and Complete Mailing Address of Publisher, Editor and Managing Editor-Publisher: Zoological Education Network, PO Box 541749, Lake Worth, FL 33454-1749. Editor: Linda R. Harrison, PO Box 541749, Lake Worth, FL 33454-1749. Managing Editor: N/A. 10. Owner: Zoological Education Network, Inc.: Dana O'Donoghue, President, PO Box 541749, Lake Worth, FL 33454-1749; Linda R. Harrison, Director, PO Box 541749, Lake Worth, FL 33454-1749; Tanya Harrison-Coffinberry, Shareholder, 7108 Crossroads #325, Brentwood, TN 37027. 11. Known Bondholders, Mortgagees and Other Security Holders Owning or Holding 1 Percent or More of Total Amount of Bonds, Mortgages or Other Securities: None. 12. Tax Status: Has not changed during preceding 12 months. 13. Publication Title: EXOTIC DVM Veterinary Magazine. 14. Issue Date for Circulation Data Below: Vol 8, Issue 5 to Vol 9, Issue 2 (November 2006 - October 2007). 15. Extent and Nature of Circulation—15a. Total Number of Copies (Net press run). Average No. Copies Each Issue During Preceding 12 Months: 1,700; No. Copies of Single Issue Published Nearest to Filing Date: 1,025. 15b. Paid and/or Requested Circulation—1. Paid/Requested Outside-County Mail Subscriptions Stated on Form 3541: Average No. Copies Each Issue During Preceding 12 Months: 816; No. Copies of Single Issue Published Nearest to Filing Date: 621. 2. Paid In-County Subscriptions: Average No. Copies Each Issue During Preceding 12 Months: 1; No. Copies of Single Issue Published Nearest to Filing Date: 0. 3. Sales Through Dealers and Carriers, Street Vendors, Counter Sales and Other Non-USPS Paid Distribution: Average No. Copies Each Issue During Preceding 12 Months: 0; No. Copies of Single Issue Published Nearest to Filing Date: 0. 4. Other Classes Mailed Through the USPS: Average No. Copies Each Issue During Preceding 12 Months: 307; No. Copies of Single Issue Published Nearest to Filing Date: 266. 15c. Total Paid and/or Requested Circulation (Sum of 15b. (1), (2), (3) and (4)): Average No. Copies Each Issue During Preceding 12 Months: 1,124; No. Copies of Single Issue Published Nearest to Filing Date: 887. 15d. Free Distribution by Mail (Samples, complimentary and other free)—1. Outside-County as Stated on Form 3541: Average No. Copies Each Issue During Preceding 12 Months: N/A; No. Copies of Single Issue Published Nearest to Filing Date: N/A. 2. In-County as Stated on Form N/A: Average No. Copies Each Issue During Preceding 12 Months: N/A; No. Copies of Single Issue Published Nearest to Filing Date: N/A. 3. Other Classes Mailed Through the USPS: Average No. Copies Each Issue During Preceding 12 Months: N/A; No. Copies of Single Issue Published Nearest to Filing Date: N/A. 4. Free or Nominal Rate Distribution Outside the Mail (Carriers or other means): Average No. Copies Each Issue During Preceding 12 Months: 400; No. Copies of Single Issue Published Nearest to Filing Date: 134. 15e. Total Free or Nominal Rate Distribution: Average No. Copies Each Issue During Preceding 12 Months: 400; No. Copies of Single Issue Published Nearest to Filing Date: 134. 15f. Total Distribution: Average No. Copies Each Issue During Preceding 12 Months: 1,524; No. Copies of Single Issue Published Nearest to Filing Date: 1,025. 15g. Copies not distributed: Average No. Copies Each Issue During Preceding 12 Months: 176; No. Copies of Single Issue Published Nearest to Filing Date: 0. 15h. Total (Sum of 15g and h): Average No. Copies Each Issue During Preceding 12 Months: 1,700; No. Copies of Single Issue Published Nearest to Filing Date: 1,025. 15i. Percent Paid and/or Requested Circulation (15c divided by 15g times 100): Average During Preceding 12 Months: 74%; Single Issue Published Nearest to Filing Date: 86%. 16. Publication of Statement of Ownership will be printed in the: Volume 9 Issue 3 of this publication. 17. I certify that all information on this form is true and complete: Dana O'Donoghue, President.

EXOTIC RESOURCES

AAV	42
AEMV	20
Avian Publications	47
Avian Spherical Collar	47
AVID	46
AVIx	Back cover
Diagnostic Imaging	47
Harrison's Bird Foods	Inside back
HEALx	4
Krieger Publishing	10, 47
Liberty Drugs	47
Lyon Technologies	8
Medical Engineering	47
Millbrook Cricket Farm	47
North American Veterinary Conf	6
Northwest ZooPath	28
Oxbow Pet Products	2
Puritan Medical Products Co	28
R.A.T.S.	20
Skip's Pharmacy	47
Universal Surgical	45, 47
University of Miami	8
Veterinary Molecular Diagnostics	5
Veterinary Specialty Products	9
Zoo/Exotic Pathology Service	42
Zoological Education Network	10
ZuPreem	Inside front



There's More to Your Bird Than Meets the Eye.



Health is more than skin deep. *Harrison's Bird Foods are the premium certified organic formulas that provide the proper nutrition to establish and maintain your bird's health, inside and out. The single most important thing you can do for your bird is to feed it right.*



*"Contact your veterinarian.
Your bird's health is their profession."
Dr. Greg J. Harrison*



Supplements from Nature



www.AVI-x.com • www.HEAL-x.com
800-946-4782 • 561-641-6745
Contact us for veterinary pricing.