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Thanks to our sponsors for your continued support; without it, we could not have grown into the organization we are today.

APV Education Fund

Elizabeth R. Griffin Research Foundation
Thank you to the Elizabeth R. Griffin Research Foundation for their continued grant support to APV's education fund. The Elizabeth R. Griffin Research Foundation, Inc. is a non-profit foundation that was established in 1999 in the memory of Elizabeth R. "Beth" Griffin (1975-1997). Beth, who was an honors graduate of Agnes Scott College, was working as a researcher at Yerkes Primate Center when she contracted the rare macaque-borne Herpes B virus and subsequently died. Following her death, Beth's family established the foundation with the fervent desire that the scientific community and general public could continue to learn from the life of a young woman who had so much to offer the world. The Foundation's motto is Safe Research Saves Lives. For more information about the Elizabeth R. Griffin Research Foundation, contact Jim Welch at (423) 612-7233.

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www.animalspecialties.biz
Contact: William Clarke
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Chinese Laboratory Primate Association
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Chaoyang District, Beijing, China
Phone: +86-10-64896353
Fax: +86-10-64896353
www.cipa.org.cn
The Chinese Laboratory Primate Association (CLPA) consist of 30 NHP breeding farms and 20 entities specialized in research quarantine trading. It acts as a bridge between government and its members, assisting government in establishing a quota system and to supervise market. CLPA also develops academic exchanges among members and end-users, helps end-users to access high-quality animals, and provides assistance.

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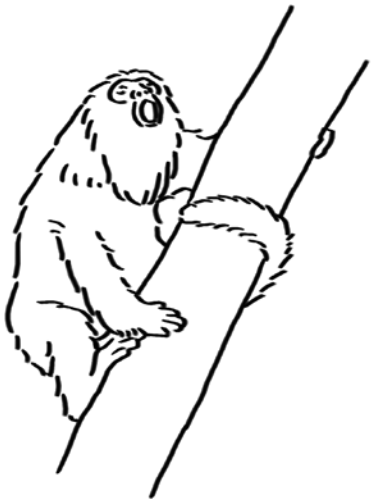

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Board of Directors Meeting
Wednesday, October 10, 7:00 p.m.–9:30 p.m. ..... Bottecelli Room
Saturday, October 13, 12:00–1:00 p.m. ..... Bottecelli Room

Registration
Wednesday, October 10, 3:00 p.m.–9:00 p.m. ..... Foyer
Thursday, October 11, 7:00 a.m.–5:00 p.m. ..... Foyer
Friday, October 12, 8:00 a.m.–12:00 p.m. ..... Foyer

Speaker Ready Room
Wednesday, October 10–Saturday, October 13 ..... DaVinci Room

Primate Center Veterinarians Meeting (regional primate center vets only)
Thursday, October 11, 5:30 p.m.–6:30 p.m. ..... Tuscany Ballroom

Industry Veterinarians Meeting
Thursday, October 11, 5:30 p.m.–6:30 p.m. ..... Venice Room

Hospitality Suite—hosted by the Hospitality Committee
Wednesday, October 10, 7:00 p.m.–12:00 a.m. ..... Suite 225–227
Thursday, October 11, 10:00 p.m.–12:00 a.m. ..... Suite 225–227
Friday, October 12, 10:00 p.m.–12:00 a.m. ..... Suite 225–227

WEDNESDAY 10.10.06

3:00 p.m.–9:00 p.m. **Registration** (*Foyer*)

7:00 p.m.–9:30 p.m. **Board of Director's Meeting**
Bocelli Room

7:00 p.m.–12:00 a.m. **Hospitality Suite**
Suite 225–227

THURSDAY 10.11.06

7:00 a.m.–8:00 a.m. **Continental Breakfast** (*Atrium*

7:00 a.m.–5:00 p.m. **Registration** (*Foyer*)

8:00 a.m.–8:15 a.m. **Welcome & Announcements:** Buddy Capuano
Venice Tuscany Ballroom

Travel Award Presentations: Ruth Woodward
Venice Tuscany Ballroom

8:50 a.m.–9:40 a.m. **Session 1 Case Reports: Novel Treatment Strategies**
Moderator: Pat Turner
Venice Tuscany Ballroom

- Effects of the Macrolide Drug Tylosin on Chronic Diarrhea in Rhesus Macaques, Rebecca S. Blackwood☆
- Treatment of Conjuctivitis by Subtenon Injection, Sylvia Gografe
- Using Fenbendazole in Commercial Non-Human Primate Diets and a Fecal Parasite Concentrator to Manage Intestinal Parasites in Macaques, Lorna Millen
- Asymptomatic Ependymal Cyst in Adult Cynomolgus Macaque, Kelly P. Yamada☆
- Trichobezoar Prevention Using Soy Lecithin Supplementation in Galagos (*Otolemur garnei*), Margaret S. McTighe
- Urinary Alkalinization in the Treatment of Traumatic Rhabdomyolysis in Rhesus Macaques (*Macaca mulatta*), Pablo R. Morales
- Localized Allergic Dermatitis Treated with Tacrolimus Ointment in a Rhesus Macaque (*Macaca mulatta*), Stephanie Torreilles

☆ Student Travel Award Recipient

10:00 a.m.–10:10 a.m. **Break** *Prefunction Room*

10:10 a.m.–12:10 p.m. **Session 2 Case Reports: Emergency and Critical Care**
Moderator: Ruth Woodward
Venice Tuscany Ballroom

- Acute Anorexia and Lethargy Associated with Pyrexia in an Adult Rhesus Macaque (*Macaca mula a*), Kelly M.S. Hugunin☆
- Fractures Associated with a Breeding Colony of SPF Cynomolgus Monkeys, Joe Wagner
- Stress Cardiomyopthy Following Severe Soft Tissue Trauma in a Chimpanzee (*Pan troglodytes*), Brigid V. Troan
- Calcinosis Cutis in Rhesus Macaques (*Macaca mula a*) Associated with Trauma, Joyce K. Cohen
- Adenocarcinoma in a Chimpanzee, Bill Satterfield
- Management of Iatrogenic Hypoglycemic Coma in a Rhesus Macaque (*Macaca mula a*), Christina Cruzen
- Psychosocial Stress and Diet Choice, Lynn A. Collura
- Acute Renal Failure Associated with Sepsis in Three Rhesus Macaques (*Macaca mula a*), Kirstin F. Barnhart

☆ Student Travel Award Recipient

12:10 p.m.–1:20 p.m. **Lunch** *Atrium*

1:20 p.m.–3:20 p.m. **Special Topic: Diagnostic 101: A Laboratory Users' Guide to Pathogen Testing in Nonhuman Primates:** Joe Simmons, Nick Lerche, Bob Peters, Julia Hilliard
Venice Tuscany Ballroom

3:20 p.m.–3:30 p.m. **Break** (*Prefunction Room*

3:30 p.m.–5:30 p.m. **Round-table Discussion: Clinical**
Moderator: Gwen Maginnis
Venice Ballroom

- Colitis in Macaques
- Electronic Records and Database Software
- Alopecia

Round-table Discussion: Management
Moderator: Gale Galland
Tuscany Ballroom

- CDC NHP Import Update
- TB Testing Update
- USDA Update

5:30 p.m.–6:30 p.m. **Industry Veterinarians Meeting**
Venice Ballroom

5:30 p.m.–6:30 p.m. **Primate Center Veterinarians Meeting** (regional primate center vets only)
Tuscany Ballroom

5:30 p.m.–6:30 p.m. **Cocktails** (cash bar)

7:30 p.m.–9:00 p.m. **Dinner**
Florence and Milan Ballroom

10:00 p.m.–12:00 a.m. **Hospitality Suite**
Suite

FRIDAY
10.12.06

6:30 a.m.–7:30 a.m. **Platinum Sponsors' Breakfast**
(board members and platinum sponsors only)
Donatello Room

7:00 a.m.–8:00 a.m. **Buffet Breakfast (***Atrium*

8:00 a.m.–12:00 p.m. **Registration** *(Foyer)*

8:00 a.m.–8:05 a.m. **Announcements:** Buddy Capuano
Venice Tuscany Ballroom

8:05 a.m.–9:50 a.m. **Session 3 Case Reports: Cutting-Edge Techniques**
Moderator: Rusty Brady
Venice Tuscany Ballroom

- Techniques for Treating Vaginal Prolapses, Joseph T. Newsome
- Determining Efficacy of Post-endoscopic Biopsy Treatment with Sucralfate on Appetite in Nonhuman Primates, Morgan L. Singletary
- Non-Invasive Blood Pressure Determination for Continuous Anaesthesia Monitoring in Nonhuman Primates, Barthel Schmelting
- Molecular Epidermicological Investigation of Simian Varicella Virus Infection in Two Immunocompromised Rhesus Macaques (*Macaca mula a*), Steven T. Shipley
- Some Advances from the Use of Macaques in Gene Therapy, Rebecca L. Grant
- Limitations of Measles Diagnostic Testing in Rhesus Macaques (*Macaca mula a*), Lisa C. Halliday
- Colonoscopy in Rhesus Macaques (*Macaca mula a*)—Principles, Procedures, and Problems, Bruce Bernacky

9:50 a.m.–10:15 a.m. **Herpes B Update:** Julia Hilliard
Venice Tuscany Ballroom

10:15 a.m.–10:30 a.m. **Break Break (***Prefunction Room*

10:30 a.m.–11:30 p.m. **Session 4 Case Reports: What's Your Diagnosis?**
Moderator: Gwen Maginnis
Venice Tuscany Ballroom
- Persistent Conjunctivitis in a Rhesus Macaque (*Macaca mula a*), Nancy L. Merrill
- Focal Pyogranulomatous Encephalitis in a Rhesus Macaque (*Macaca mula a*), Maria T. Zayas
- Failure to Thrive in a Cynomolgus Monkey (*Macaca fascicularis*), Melaney K. Gee
- Abdominal Mass in a Squirrel Monkey, Rusty Brady

11:30 p.m.–12:15 p.m. **Round-table Discussion: Cardiomyopathy in Nonhuman Primates**
Venice Tuscany Ballroom
- Cardiac Disease in New World Monkeys Alfonso Gozalo
- Cardiomyopathy in Captive Chimpanzees (*Pan troglodytes*) D. Rick Lee and Michael Lammey

12:15 p.m.–1:30 p.m. **Lunch** *Atrium*

1:30 p.m.–3:45 p.m. **Session 5 Case Reports: General Topics**
Moderator: Tom Nolan
Venice Tuscany Ballroom
- Irregular Cutaneous Scalp Mass in a Rhesus Macaque (*Macaca mula a*), Tara G. Ooms
- Physiological and Behavioral Effects of Social Introduction on Adult Male Rhesus Macaques (*Macaca mula a*), Lara A. Doyle
- Multiple Congenital Deformities Including Sternoschisis and Scoliosis in a Newborn Rhesus Macaque (*Macaca mula a*), Lauren Drew Martin
- Gestational Trophoblastic Disease in an Adult Female Cynomolgus Macaque (*Macaca fascicularis*), Carol Emerson
- Compliant Housing of Nonhuman Primates in Preclinical Safety Testing, Susanne Rensing
- Diagnosis and Treatment of Nephrotic Syndrome in a Male Captive Chimpanzee (*Pan troglodytes*), Michael Lammey
- Fluid-Filled Cyst in the Caudal Abdomen of a Rhesus Macaque (*Macaca mula a*), Jennifer Bacon
- Visceral and Neural Larva Migrans in Rhesus Macques (*Macaca mula a*), Alfonso Gozalo
- Husbandry and Veterinary Procedures for a BSL-3 Macaque Facility, Lisa C. Halliday

3:45 p.m.–4:00 p.m. **Break (***Prefunction Room*

4:00 p.m.–5:00 p.m. **APV Business Meeting** (members only)
*Venice Tuscany Ballroo*m

5:30 p.m.–6:30 a.m. **Cocktails** (cash bar)

6:30 p.m.–10:00 p.m. **Dinner and Auction**
Florence and Milan Ballroom

10:00 p.m.–12:00 a.m. **Hospitality Suite**
Suite

SATURDAY
10.13.06

7:00 a.m.–8:00 a.m. **Continental Breakfast (***Atrium*

8:00 a.m.–8:05 a.m. **Announcements:** Buddy Capuano
Venice Tuscany Ballroom

8:05 a.m.–9:05 a.m. **Special Topic—The Dynamics of Endodontic Treatment: Mario Alves**
Venice Tuscany Ballroom

9:05 a.m.–10:05 a.m. **Session 6 Case Reports: Unusual Cases**
Moderator: Gwen Maginnis
Venice Tuscany Ballroom
- New Innovations in Primary Housing for Great Apes, Paul Spurlock
- Invasive Primate Neuroscience: Is More Regulation or Better Management the Key to Success?, Paul Honess
- Surgical Placement of Vascular Access Ports in Common Marmosets, Lessions Learned, Mary Sauer
- Fundamentals of Vascular Access Ports in Nonhuman Primates, Jan Bernal

10:05 a.m.–10:20 a.m. **Break (***Prefunction Room*

10:20 a.m.–10:45 a.m. **Special Topic—NHP Breeding in China: the Status and Prospective:** WZ Fang
Venice Tuscany Ballroom

10:45 a.m.–11:00 a.m. **AMP Update:** Jacquie Calnan
Venice Tuscany Ballroom

11:00 a.m.–11:15 a.m. **Journal of Medical Primatology: Proceedings and Publications:** Preston Marx
Venice Tuscany Ballroom

11:15 a.m.–11:45 a.m. **ILAR's International Primate Plan:** Buddy Capuano
Venice Tuscany Ballroom

11:45 a.m.–12:00 p.m. **Closing Remarks**
Venice Tuscany Ballroom

12:00 p.m.–2:00 p.m. **Board of Director's Meeting**
Bo ecelli Room

Case report abstracts listed chronologically by category

Novel Treatment Strategies

Effects of the Macrolide Drug Tylosin on Chronic Diarrhea in Rhesus Macaques (*Macaca mula a*)

RS Blackwood*, RP Tarara, KL Christe, A Spinner, NW Lerche

California National Primate Research Center, University of California, Davis, CA

Diarrhea is the most frequently encountered gastrointestinal disease in captive rhesus macaques. The precise pathogenic mechanisms underlying chronic diarrhea in nonhuman primates are not well understood, but a persistent inflammatory component has been strongly implicated. This study evaluated the inflammatory changes in the colon of affected macaques and assessed efficacy of a 10-day course of tylosin in a cohort of 21 animals with chronic diarrhea. Stool quality was evaluated daily and fecal consistency was scored. Colonoscopies were performed; biopsy samples were characterized histologically and assayed for expression of tumor necrosis factor alpha (TNFα) mRNA. Blood samples collected pre-, mid-, and post-treatment were assayed for C-reactive protein (CRP). Results indicate that 63% of animals receiving tylosin showed improvement in stool quality compared to 10% in the sham-treated group. Histologically, 82% of animals in the tylosin-treated group had a reduction in the severity of colonic lesions post-treatment, as opposed to 40% of animals in the sham group. There was no significant difference in TNFα mRNA in either tylosin- or sham-treated animals before or after treatment. CRP levels serially decreased in tylosin treated monkeys; the average post-treatment CRP value for tylosin-treated animals was 11.96 ± 3.86 μg/ml compared to 26.48 ± 4.86 μg/ml for sham-treated controls. In conclusion, tylosin significantly improved the fecal consistency score (FCS), significantly decreased colonic inflammation, and significantly decreased serum CRP levels post-treatment in rhesus macaques with chronic diarrhea.

Treatment of Conjunctivitis by Subtenon Injection

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Conjunctivitis is a common occurrence in nonhuman primates. It can become a chronic disease, especially in older animals or animals with predisposing co-morbidities such as Diabetes mellitus type 2. Treatment is usually accomplished with instillation of an antibiotic ointment with or without a steroid at least twice a day. However, if the monkey is not trained to present for treatment, the ocular instillation of ophthalmic ointment can be very challenging. Very often the animal needs to be chemically restrained. Being anesthetized twice daily for several days can be difficult and exhausting for the animal. Furthermore, technicians need to be trained and reliable to administer the instillation correctly. Hence, the result of the treatment very often is not satisfactory. In the author's experience, relapse of the condition even with a perfect compliance in the treatment regimen is very common in diabetic animals when treated with ophthalmic ointment alone or a combination of ophthalmic ointment and systemic antibiotics. Therefore, a treatment technique adapted from human medicine has been employed with several rhesus macaques (*Macaca mula a*) that exhibited Diabetes mellitus type 2 or metabolic syndrome: 3 subtenon injections of an antibiotic drug combined with a local anesthetic, 48 h apart. The technique has not only proven very suc-

cessful in curing the conjunctivitis but is also easily learned by the technician and less stressful for the animal.

Using a Fecal Parasite Concentrator for the Detection of Intestinal Parasites in Rhesus (*Macaca mula a*) and Cynomolgus Macaques (*Macaca fascicularis*)

L Millen*, K Armstrong, M Cottingham, G Fleurie

Covance Research Products, Alice, TX

Intestinal parasites in macaques and many other animals are routinely diagnosed by the use of fecal flotation. Concentration techniques can optimize the detection of parasites by increasing the number of eggs recovered and by floating heavier eggs such as those of liver flukes (*Fasciola* sp.). When our facility decided to implement fecal concentration of all samples instead of using simple fecal flotation, we had to choose a specific concentration technique. Traditional concentration techniques involve filtering the feces through gauze into a centrifuge tube, centrifuging, then decanting and resuspending the sample before examination. However, we routinely process 200 fecal samples at a time at our facility, so this process was much too labor intensive to consider. We are now using the Midi Parasep Faecal Parasite Concentrator (DiaSys Europe) to diagnose intestinal parasites in our population. The advantages of this device over other concentration techniques are numerous and include ease of use, cleanliness, and reduction of reagents. The unit comes pre-loaded with buffered formalin and requires only the addition of feces and 2.0 ml ethyl acetate. Prepared concentrator units can be held at room temperature for 24 h before centrifugation. The risk of contaminating the centrifuge is eliminated because the concentrator unit is completely enclosed. We ran 111 samples in parallel using both traditional fecal flotation with magnesium sulfate (1.2 to 1.3 sg) and the Midi Parasep system. The Midi Parasep system recovered approximately 15% more parasites than $MgSO_4$ flotation and was far superior for the detection of *Fasciola*.

Use of Fenbendazole in Commercial Nonhuman Primate Diets for the Elimination of Intestinal Parasites

L Millen*, K Armstrong, M Cottingham, G Fleurie

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Two groups of cynomolgus macaques (*Macaca fascicularis*) entering quarantine were fed commercial diets containing fenbendazole to determine the efficacy of this method of anthelminthic administration. Animals were singly housed indoors, 60 animals/room, and were subject to standard CDC quarantine procedures. Pooled fecal samples were obtained on day 1 of quarantine. In the Chinese-origin animal samples, we found hookworm eggs, *Trichuris* sp. eggs, *Balantidium coli*, *Fasciola* sp. eggs, and *Ascaris* sp. eggs; the Vietnamese-origin animals tested positive for *Trichuris* sp. only. Animals were fed biscuit-type feed containing 600 ppm fenbendazole twice a day for 5 d, at an amount sufficient for their caloric needs based on body weight. On day 6, the animals were placed on standard non-medicated feed. Fecal samples were rechecked on day 13, and all animals were negative for intestinal parasites. A separate animal group in outdoor corn crib-style housing with gravel bases were also fed the medicated feed for parasite elimination. Pooled fecal samples from two of the cribs were submitted for analysis. Both cribs tested positive for *Ascaris* sp.; Crib 2 also tested positive for *Trichuris* sp. These animals were fed medicated feed for 2 d; on day 3 they were moved to cribs in which the gravel base had been dug out and replaced with clean gravel. The animals were fed medicated feed for 5 d. On day 13, fecal samples were negative for intestinal parasites.

Asymptomatic Ependymal Cyst in an Adult Cynomolgus Macaque (*Macaca fascicularis*)

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An asymptomatic naïve adult male cynomolgus macaque (*Macaca fascicularis*) underwent a routine pre-study MRI of the brain. The MRI revealed a diffuse, bilateral cystic lesion, involving the occipital cortex, whose content was isointense with cerebrospinal fluid (CSF). On necropsy, the cystic structures communicated with the caudal aspect of the lateral ventricles and contained clear fluid compatible with CSF by fluid analysis. Histopathology showed ciliated ependymal cells lining the cyst with focal areas of hemosiderophages within the cyst wall. This lesion is compatible with an ependymal cyst, previously reported only in humans and generally considered an asymptomatic developmental anomaly.

Trichobezoar Prevention Using Soy Lecithin Supplementation in Galagos (*Otolemur garnett i*)

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Trichobezoars (hairballs) have been identified as a source of weight loss and death in prosimians. *Otolemur garnett ii* (galagos or bush babies) are avid groomers prone to hairball formation. Vanderbilt University maintains a colony of approximately 90 galagos (average daily census) for use in comparative research. Hairballs were detected in 16 animals over 6 y (1% to 4% of the colony). Treatment of hairballs consisted of surgical removal (gastrotomy) or use on a terminal protocol; 11 of the galagos underwent gastrotomy, and 5 were used in nonsurvival surgical protocols. The largest hairball removed was 40 g, removed from a female that developed 2 hairballs, 2 y apart. The average age of galagos at time of hairball detection was 1.8 y. Of the 16 affected animals, 11 (69%) were females and 5 (31%) were males. From 1999 to 2004, preventative measures included weekly treatment with oral laxative (Laxatone) plus 100% abdominal palpation at each cage change. In early 2005, we changed the diet from Purina Cat Chow to Purina Lab Diet 5280 (Ferret Diet), a nutritionally comparable diet. Extrapolating from a 2003 feline nutritional finding, soy lecithin (135 mg/kg), a fat emulsifier that prevents ingested hair from sticking together and thus eliminates hairball formation, was added to a weekly food supplement of cooked mashed sweet potatoes. Since this supplementation was initiated in January 2004, we have seen a dramatic reduction in hairballs, with no cases occurring from 2006 to present.

Urinary Alkalinization in the Treatment of Traumatic Rhabdomyolysis in Rhesus Macaques (*Macaca mulatta*)

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A 15-y-old, 9.1-kg female rhesus macaque (*Macaca mulatta*), housed in an outdoor breeding group, presented with severe crush wounds inflicted by cagemates. Physical exam revealed

a capillary refill time of 6 s, pale mucous membranes, and a heart rate of 192 BPM. Severe ecchymosis, edema, and lacerations were noted on the extremities, thorax, perineum, and face. Due to marked hypovolemia, an intravenous catheter could not be inserted. An intraosseous catheter was placed, and blood samples were collected. After the animal was secured to a restraint board, a urinary catheter was also inserted. Lab result values included BUN 52 mg/dl, creatinine 3.7 mg/dl, phosphorus 12.7 mg/dl, CPK > 30,000 U/L, and WBC 18,000 /µl (mature neutrophilia and lymphopenia). A urine test strip indicated a pH of 6.0 and blood 4+, in the absence of hematuria. These strips cross-react with myoglobin, a hemoprotein found in muscle and associated with acute renal failure 48 to 72 h post-crush injury. Current medical literature suggests urinary alkalinization (to pH > 6.5) increases myoglobin byproduct solubility in urine, allowing renal excretion with minimal tubular damage. This principle has been demonstrated to increase survival in earthquake victims, who incur analogous injuries. Mindful of this observation, we initiated fluid therapy with 0.9% saline + 50 mEq/L of sodium bicarbonate; 20 ml/kg was infused over 30 min, followed by 30 ml/kg/h for a total volume of 110 ml/kg. Urine output was monitored to maintain 1 to 2 ml/kg/h and a pH above 6.5. For two subsequent days, intravenous fluids were administered at 20 ml/kg/h for 100 ml/kg/d. Bicarbonate was discontinued once myoglobinuria abated. The animal responded well and lab values returned within normal limits. Three additional macaques with traumatic rhabdomyolysis (CPK > 65,000 U/L in one case) have been successfully treated with this protocol, with no mortality. Urinary alkalinization, correction of metabolic acidosis, and the treatment of hyperkalemia associated with rhadomyolysis make bicarbonate a rational adjunct therapy for the condition in the rhesus macaque.

Localized Allergic Dermatitis Treated with Tacrolimus Ointment in a Rhesus Macaque (*Macaca mula a*)

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An adult male rhesus macaque presented with pruritus and an exudative, inflammed, erythematous papule of approximately 1.5 cm in diameter under the chin. It was first treated daily with diluted Nolvasan and triple-antibiotic ointment resolving after 10 d. The lesion recurred several times over a 2-mo period. A punch biopsy revealed an allergic dermatitis. Treatment with Protopic (tacrolimus) ointment, an immunosuppressive drug, was initiated and appears successful at this time. Based on a literature review, this is the first report of immunosuppressive topical treatment of atopic dermatitis (commonly found in humans) in a rhesus macaque.

Emergency and Critical Care

Acute Anorexia and Lethargy Associated with Pyrexia in an Adult Rhesus Macaque (*Macaca mula a*)

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An 8-y-old male macaque presented with lethargy, anorexia, pyrexia, and swelling of a chronic IV catheter site. Diagnostics revealed azotemia, hyperphosphatemia, hyperkalemia, hypoalbuminemia, isosthenuria, hematuria, and proteinuria with elevated alkaline phosphatase. Despite treatment, he became edematous and increasingly depressed, and was euthanized.

Gross lesions included hepatomegaly with a thick, pale material associated with heart base vessels. Histopathology revealed fibrinosuppurative vasculitis and cellulitis with bacteria in the heart base and great vessels and bilateral membranoproliferative glomerulonephritis. Final cultures grew *Staphylococcus aureus*. It is hypothesized that the catheter infection induced a vasculitis that progressed to septicemia and a resultant glomerulonephritis.

Fractures Associated with a Breeding Colony of SPF Cynomolgus Monkeys

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This report describes the incidence of fractures in young male and female cynomolgus macaques in our SPF breeding colony. Animals housed in newly formed breeding groups often exert extraordinary physical activity during breeding. Unique fractures were apparent among females soon after introduction to males. Clinical history, radiographs and dexascan information will be presented. Results suggest careful attention to females upon introduction to new potential breeding partners.

Stress Cardiomyopathy Following Severe Soft Tissue Trauma in a Chimpanzee (*Pan troglodytes*)

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A 7-y-old male chimpanzee was presented after sustaining multiple bite wounds over the body during introduction to a new troop. Aggressive treatment was initiated including wound care, nutritional support, fluids, analgesics, antibiotics, and antifungals. The clinical condition initially worsened, with the development of acute renal failure and several deeper wounds becoming infected. However, blood work parameters and the animal's attitude began to improve over the next 8 to 10 d. On day 13, the chimpanzee went into cardiac arrest during immobilization. He was successfully resuscitated, but 2 d later arrested again during an immobilization procedure and died despite CPR and defibrillation. The major necropsy finding was heart failure due to severe cardiomyopathy characterized by subacute myocardial necrosis with contraction bands, regeneration, and early fibrosis. Lesions were most prominent in the papillary muscle and on the subjacent epicardial and endocardial surfaces. Other evidence of heart failure included renal nephrosis, acute pulmonary edema, and centrilobular hepatocellular atrophy. Multiple skin wounds were also observed. The clinical history and necropsy findings are consistent with stress cardiomyopathy (alternatively called brain-heart syndrome) in which myocardial necrosis follows an episode of acute, severe sympathetic stimulation. Classically, this syndrome is described in cases of brain trauma, but similar cardiac lesions have been reported after severe soft tissue injury.

Calcinosis Cutis in Rhesus Macaques (*Macaca mula a*) Associated with Trauma

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A 3-y-old male rhesus macaque presented with chronic intermittent swelling of both hands. Upon examination, a white, chalky substance was expressible. The animal was treated with antibiotics (Rocephin) and anti-inflammatories (Metacam) along with surgical debulking. A

bacterial culture was negative. Radiographs revealed mineralized material present throughout both hands. Hematology and serum chemistry were non-remarkable. Ionized calcium was within normal limits (1.35). Urinalysis revealed a mild hyposthenuria (USG 1.005). An ACTH stimulation was performed (cortisol pre 22.1, post 39.6) which did not rule out hyperadrenocorticism. The swelling progressed despite treatment, and the animal was euthanized due to the severity of the condition. Necropsy and histopathology findings were consistent with calcinosis cutis but did not support a diagnosis of hyperadrenocorticism. There are few case reports of calcinosis cutis in nonhuman primates. Nine cases of calcinosis cutis have been noted in rhesus macaques at the Yerkes National Primate Research Center over 17 years. These cases of calcinosis cutis have occurred in extremities (digits and tails) and appear to be associated with a history of trauma at the site of formation. There does not appear to be an association between calcinosis cutis and elevated serum levels of calcium or any other serum chemistry abnormalities. Calcinosis cutis can be either metastatic or dystrophic and has been associated with hypercalcemia from underlying conditions such as neoplasia, hyperadrenocorticism or iatrogenic. Calcinosis cutis caused by dystrophic calcification has been reported in humans associated with immunodeficiencies, congenital disorders, fat necrosis, intrauterine herpes infection in neonates, and trauma.

Adenocarcinoma in a Chimpanzee

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Chimpanzees are used as a model for specialized areas of biomedical research because of their unique immunologic and genetic similarity to humans. This model is usually reserved for research projects when rodents or other nonhuman primates will not be predictive outcomes for the biomedical applications in humans. Carcinomas are not a commonly reported or diagnosed malignancy in chimpanzees. This case report will present in detail the clinical history of this case, including diagnostic imaging, biopsy techniques, and surgery of a salivary adenocarcinoma.

Management of Iatrogenic Hypoglycemic Coma in a Rhesus Macaque (*Macaca mula a*)

C Cruzen*

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Although accidental overdoses of insulin in diabetic pets are not uncommon, reports of insulin overdose in nondiabetic animals are infrequent, and recommendations for treatment are difficult to find. In all reported cases, treatment begins very early after insulin administration (prior to the onset of hypoglycemic coma). In addition, the pharmacokinetics of high doses of glargine insulin is not well established. In our facility, a case of iatrogenic glargine insulin overdose leading to a comatose state was successfully managed with continuous administration of intravenous dextrose solution and supportive care. A 6-y-old female macaque being treated for a skin wound presented early in the morning as recumbent and non-responsive in her cage. Physical exam findings at presentation showed severe bradycardia and arrhythmia, shallow and slow respirations, hypothermia, dorsoflexion of neck, and rigid extension of legs. I-stat analysis revealed profound hypoglycemia and hypokalemia. Investigation revealed that the animal was inadvertently given 140 units of glargine insulin the previous morning. Intravenous fluids with added dextrose combined with frequent dextrose boluses as needed (at 12.5%, 25%, or 50%) were provided for 32 h, at which point the animal was able to sit up for

brief periods and was attempting to eat. Blood glucose and other vital signs remained stable after the animal was able to eat, but the animal remained lethargic, mildly ataxic, and blind for 72-96 h after initial presentation. Complete recovery of the animal, including resolution of blindness, occurred after 96 h.

Psychosocial Stress and Diet Choice

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Obesity is a growing medical and societal concern in developed countries. While availability of inexpensive, calorically dense foods contributes to this epidemic, emerging data, largely from rodents, suggests exposure to chronic stressors changes food preferences and the consumption of "comfort foods." Because stress-induced increases in endogenous opioids can increase feeding, the present study tested the hypothesis that an opioid receptor antagonist would decrease consumption of a high-fat diet (HFD) in animals exposed to psychosocial stressors. As social subordination in stable groups of rhesus monkeys (Macaca mulatta) is an ethologically relevant psychosocial stressor, we quantified the intake of a low-fat diet (LFD) and HFD 24 h each day for 21 d in 2 groups of adult females by use of an automated feeding station that identified individual monkeys from a unique microchip in the carpal regions. Animals were treated with a 21-d extended release formulation of the opioid antagonist naltrexone or received no implant as the control condition. The order of treatment was randomized and was separated by a 21-d washout. Subordinate females consumed significantly more of both the LFD and HFD throughout the day and night during both control and naltrexone treatments. Consumption of these diets was restricted to the daytime for dominant females. Food intake was not associated with differences in plasma ghrelin. Subordinate females showed higher gains in both body weight and BMI. These data suggest that changes on reward pathways other than opioids may mediate stress-induced consumption of comfort foods.

Acute Renal Failure Associated with Sepsis in Three Rhesus Macaques (*Macaca mula a*)

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One male and two female rhesus macaques, aged 7 to 18 y, were diagnosed with acute renal failure (ARF) and inflammation due to an unknown etiology. The initial presentation of these monkeys varied from lameness and diarrhea to retention of a dead fetus. Initial clinicopathologic findings were similar in all cases and included severe azotemia, hyperphosphatemia, hypertriglyceridemia, hyponatremia, hypokalemia, hypochloremia, decreased antithrombin III, and neutrophilia with a regenerative left shift. Urine output appeared decreased in all three cases, and in one case gross hematuria was noted. Initial treatment included intravenous fluids, antibiotics, Lasix, and nutritional support. Despite aggressive therapy and parenteral administration of Baytril and Imipenem to the first affected monkey, the animal's clinical condition deteriorated and the neutrophilia persisted. Although hepatic involvement was not evident, the severity of the ARF associated with oliguria and marked hypokalemia were consistent with Leptospirosis and penicillin was administered. A marked decrease in the neutrophil count in the first 24 h was noted; however, the monkey worsened clinically, developed signs of disseminated intravascular coagulation (DIC), and was euthanized. A necropsy was performed. Histopathologic examination confirmed a cortical nephropathy affecting primar-

ily the tubules and DIC. Bacterial cultures of the blood and kidneys were negative. Warthin-Starry staining of a kidney section identified spirochetes in the renal tubules; however, PCR analysis and immunohistochemical staining for *Leptospira* spp. were negative. In the two subsequent cases, earlier administration of penicillin was associated with a more favorable response and both monkeys recovered following approximately 1 wk of hospitalization and intensive care.

Cutting-edge Techniques

Techniques for Treating Vaginal Prolapses

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This presentation will review typical pathogenesis associated with vaginal prolapse in macaques as well as historic and novel treatment modalities. An initial review of predisposing factors for vaginal prolapse and possible preventive medicine management issues will be reviewed. Clinical management and discussion concerning choices for medical remediation and or surgical repair options. Non-surgical techniques, including both mechanical and pharmacological interventions, will be reviewed. In addition, a review and update of surgical options including Caslick, colpocleisis, and sarcolpopexy procedures in relation to case studies will be presented.

Determining Efficacy of Post-endoscopic Biopsy Treatment with Sucralfate on Appetite in Nonhuman Primates

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Endoscopy with duodenal biopsy is a diagnostic tool frequently used for clinical and research purposes in nonhuman primates. Although many institutions use this procedure, post-procedural treatments are often varied. We performed a study using animals in which endoscopy with duodenal biopsies were completed as requested in the IACUC-approved protocol to which the animals were assigned. After endoscopy was performed, animals were randomly separated into 2 groups; the first group received sucralfate during the procedure and for 5 d post-procedure, and the second group received no sucralfate. This presentation will include the results of this study and an overview of the mechanism of action of sucralfate. A review of current literature in regards to the pharmacokinetics of the drug, its proven uses, and interactions with growth factors present at duodenal ulcer sites will also be discussed.

Non-invasive Blood Pressure Determination for Continuous Anesthesia Monitoring in Nonhuman Primates

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Pivotal and serious side effects of anaesthetic drugs are depression of respiration and of the cardiovascular system, while increased blood pressure (BP) of ≥ 10% during anesthesia is considered to be a positive response to nociceptive stimulation that may require appropriate

action as well. Invasive techniques represent the major approach for accurate blood pressure determination in small species obviating routine use in veterinary practice. Non-invasive high-definition oscillometry allows visible, real-time screen control of measurements using BP amplitude scans up to 16.000 Hz, and was used for anesthesia monitoring in *Callithrix jacchus* (n = 6) and *Macaca fascicularis* (n = 6) under 2 different anesthetic regimens: ketamine (cynomolgus: 10 mg/kg, marmoset: 50 mg/kg) and ketamine-xylazine (cynomolgus: ketamine 10 mg/kg, xylazine 0.3 to 0.7 mg/kg; marmoset: ketamine 15 mg/kg, xylazine 3 mg/kg). Systolic and diastolic BP, mean arterial pressure (MAP) and pulse/min were determined individually in 1-min intervals. After ketamine injection, initial increases in pulse rate and MAP were only observed in marmosets, whereas both species showed slightly decreased BP and pulse rate afterwards. Following ketamine-xylazine injection, MAP reduction was more prominent and heart rate decreased up to factor 2 (cynomolgus) or 3 (marmoset). Despite a higher dose, xylazine appeared better tolerated by marmosets, as the lowest MAP (approximately 45 mm Hg) was noted in cynomolgus monkeys. The cardiovascular changes remained during recovery. Our findings demonstrate the feasibility and convenience of non-invasive blood pressure determination for continuous anaesthesia monitoring in nonhuman primates.

Molecular Epidemiological Investigation of Simian Varicella Virus Infection in Two Immunocompromised Rhesus Macaques (*Macaca mula a*)

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We describe a clinical and epidemiological investigation of two cases of simian varicella virus (SVV) infection in immunosuppressed rhesus macaques housed in a single animal room. The two macaques developed acute generalized maculo-papular lesions on the skin, post-gamma irradiation. At necropsy, following euthanasia for humane reasons, both animals had acute inflammatory lesions on the lungs and petechiations on the GI tract, and one had white raised plaques of approximately 1 mm diameter multifocally on all liver lobes. On the basis of real-time DNA PCR and histopathology, a confirmatory diagnosis of SVV was made. As a part of the epidemiological investigation, real-time DNA PCR was also performed on saliva samples from the rest of the animals in the room. SVV DNA was found in saliva from 2 animals which were not immunocompromised. Subclinical reactivation of SVV and shedding of virus through saliva could be considered the source of infection of these immunocompromised macaques.

Some Advances from the Use of Macaques in Gene Therapy

RL Grant*

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Macaques have become the animal model of choice to analyze our viral gene transfer vectors before they are used in human clinical trials. Although our viral gene transfer vectors are extensively tested in murine models, murine species do not represent as close a biological and physiological model to the human as do macaques. Additionally, the toxicological and immune responses of a macaque more closely represent that of humans. The viruses we used to create replication-defective gene transfer vectors are retroviruses, adenoviruses or adeno-associated viruses. Retroviruses are a class of enveloped viruses that contain a single-stranded RNA molecule as the genome. Subsequent to infection, the viral genome is

reverse transcribed into double-stranded DNA, which integrates into the host genome and is expressed as proteins. Adenovirus vectors can infect non-dividing cells with high efficiency. Unlike retroviral vectors, they do not integrate into the host genome; thus, gene expression is lost with time. Adeno-associated viruses are human parvoviruses that are dependant on a helper virus, usually an adenovirus, to proliferate.

Limitations of Measles Diagnostic Testing in Rhesus Macaques (*Macaca mula a*)

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Three juvenile male rhesus macaques from a single commercial source presented during the quarantine period with skin lesions consistent with measles infection, including maculopapular rash and respiratory disease. The animals were imported from China in late 2006 and completed primary quarantine without incident. One animal arrived at the University of Illinois at Chicago in a group of 10 juvenile and 8 adult rhesus in January 2007. The other 2 animals arrived in a group of 15 juvenile rhesus in February 2007. All 3 animals were euthanized due to significant respiratory compromise approximately 4 to 6 wk after arrival. Although clinical signs were consistent with measles, limitations in current diagnostic testing did not allow a definitive diagnosis to be made antemortem. Blood samples were submitted to commercial laboratories for serologic and polymerase chain reaction (PCR) testing for measles virus; results from ELISA, MFIA, and PCR were negative. The diagnosis was not confirmed until tissues collected at necropsy were submitted for immunohistochemistry, which showed they demonstrated high levels of measles antigen in multiple tissues. However, serum submitted after necropsy tested positive for measles virus antibody by immunofluorescence assay. This presentation will focus on the limitations of current commercial serologic and PCR testing encountered during diagnosis of an outbreak of measles in recently imported juvenile Chinese-origin rhesus macaques. In addition to the diagnostic testing procedures, an overview of the clinical course of disease in these animals will be provided.

Colonoscopy in Rhesus Macaques (*Macaca mula a*): Principles, Procedures, and Problems

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For diagnosis of large intestinal disease, endoscopic evaluation of the colon using a flexible endoscope can be of tremendous scientific value and routinely performed in rhesus macaques. To accomplish this, certain criteria must be met to ensure success: a thorough knowledge of the equipment, technique and animal anatomy involved; proper patient preparation; the ability to obtain adequate biopsy samples; and the use of personnel in defined roles. This presentation will describe the indications for performing a colonoscopy, the required equipment, personnel needed, patient preparation, technique, normal findings, the complications inherent to performing a colonoscopy, and those specific to colonoscopy in macaques.

What's Your Diagnosis?

Persistent Conjunctivitis in a Rhesus Macaque (*Macaca mula a*)

NL Merrill*

Madigan Army Medical Center, Steilacoom, WA

From August 2004 to February 2005, an 8-y-old male rhesus macaque had recurring problems of the left eye that were initially diagnosed as conjunctivitis; the eye was swollen shut, the eyelid was reddened, and a watery drainage was present. The macaque had been housed at Walter Reed Army Institute of Research for 2 y without any medical problems except for GI upset, was singly caged, and had always been Tb negative. Multiple evaluations, cultures, and treatments (antibiotics and steroids) were tried without complete resolution of the eye problems. After 6 mo, a foreign object was discovered in the eye; it had been placed and sutured (non-resorbable 5″0″) behind the left eyeball during an ophthalmic protocol in 1998. According to the records, this object had been removed in December 2000. It took 4 y for the suture to degrade and allow the plastic tubing to migrate and cause problems.Had these conjunctivitis symptoms arisen during a routine Tb test, the animal would have been euthanized.

Focal Pyogranulomatous Encephalitis in a Rhesus Macaque (*Macaca mula a*)

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A 20-y-old female rhesus macaque developed a left-side head tilt with contralateral facial paralysis and proprioceptive deficits. Clinical history included an injury to the right ear resulting in a fistulous tract below the right pinna with subsequent obliteration of the associated ear canal. More recently, possible head trauma occurred during recovery from ketamine-induced anesthesia. Corticosteroids and a 7-d course of antibiotic therapy resulted in temporary cessation of the clinical signs. These signs reoccurred 1 wk later, with worsening of the previous signs. The same treatments were reinstated and again the clinical signs abated. Magnetic resonance imaging (MRI) indicated a mass lesion on the right side involving the brain stem and the adjacent cerebellum. Complete blood count (CBC) demonstrated a mild neutrophilia, and stool samples revealed occult fecal blood. Computed tomography (CT) did not disclose abnormalities of the abdominal organs. The animal was euthanized because of the deteriorated clinical condition and poor prognosis. The brain was preserved intact and, upon sectioning, a well-demarcated, irregularly shaped, multilobular, pale yellow mass was identified in the cranial part of the brain stem with compression of the adjacent cerebellum and displacement of fourth ventricle, in association with a 1-mm diameter bony mass arising from the right cranial vault. Histologically, the lesion was diagnosed as pyogranulomatous inflammation and the bony mass was diagnosed as focal chronic proliferative inflammation. Periodic acid Schiff and Gram stains failed to identify causative agents. Immunohistochemistry for amoebae were negative, and electron microscopy provided no further information as to etiology.

Failure to Thrive in a Cynomolgus Monkey (*Macaca fascicularis*)

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A 3.5-y-old male cynomolgus monkey was examined for intermittent diarrhea, abdominal distension, and failure to thrive in comparison to age-matched cage mates. Routine diagnostics included complete blood count, serum chemistry, urinalysis, rectal cultures, fecal exams for parasite ova and giardia, survey radiographs, and abdominal ultrasound. Results of these tests revealed mild to moderate anemia and thrombocytosis, and moderate hypoproteinemia and hypoalbuminemia. Polymerase chain reaction assay for simian retrovirus (SRV) types 1 and 2 were negative. Serum hormone levels for testosterone, growth hormone, insulin-like

growth factor-1, and thyroxine (T4) were within normal range and were used to rule out hypothyroidism and pituitary dwarfism. Pre- and post-prandial bile acid values excluded congenital and acquired portosystemic shunt. Negative titers for anti-endomysial and anti-tissue transglutaminase antibodies, along with a gluten-free diet, were used to rule out gluten-sensitive enteropathy. Serum B12 and folate levels were lower than normal values referenced for humans, dogs, or cats, and were suggestive of exocrine pancreatic insufficiency, though fecal trypsin enzymatic activity was present and only a marginal response to dietary supplement with pancreatic enzymes was noted. No diagnosis was confirmed, and the condition did not improve. Humane euthanasia was elected. Gross morphologic and histologic necropsy findings revealed a persistent left superior vena cava, premature physeal closure, and a systemic chronic inflammatory condition. A genetic basis for the multi-systemic abnormality of growth was suspected.

Abdominal Mass in a Squirrel Monkey

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In February, an aged, wild-caught, Guyanese female squirrel monkey, housed in a small group breeding run, was discovered with a distended abdomen. She was hypothermic and lethargic. An enlarged uterus consistent with pregnancy was palpated. Ultrasonography revealed an abdominal mass but no fetus. Absolute leukopenia (WBC = 2.18 m/mm^3) with moderate normocytic, normochromic anemia (HCT = 22.9) was detected in the complete blood count. Serum chemistry abnormalities included hypoproteinemia (TP = 5.2 g/dl), hypocalcemia (CA = 7.3 mg/dl), mild azotemia (BUN = 43 mg/dl), and hyperphosphatemia (PHOS = 9.2 mg/dl). Supportive therapy was initiated and exploratory surgery undertaken to determine the etiology of the mass. A large, multinodular mass arising from the uterus and adhering to the omentum was found. The surgeon determined that the mass was inoperable. Because of her age, condition, and poor prognosis, the monkey was euthanatized. At necropsy, the uterus was markedly enlarged, with multiple nodules extending from the myometrium. The uterine lumen contained dry white exudate, and the endometrium was effaced. Small raised white foci and nodules were found within the omentum, mesentery, and the dorsum of the liver. Two small cysts were found on the dorsum of the caudal lung lobes. Microscopically, there were multiple large areas of coagulative necrosis with multifocal bacterial colonies and locally extensive suppurative inflammation. The myometrium was highly cellular, with largely ovoid cells with marked nuclear pleomorphism and abundant clear to lightly eosinophilic cytoplasm.

General Topics

Irregular Cutaneous Scalp Mass in a Rhesus Macaque (*Macaca mula a*)

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A 21-y-old, 7.4-kg female rhesus macaque (*Macaca mula a*) was presented for apparent trauma to the head. This macaque was born at the Tulane National Primate Research Center and maintained on a globoid cell leukodystrophy breeding protocol; polymerase chain reaction confirmed carrier status for this autosomal recessive genetic disorder. Viral screening was

negative for all retroviruses but positive for Cercopithecine herpes virus-1. Examination revealed severe dental disease and a 3 cm x 3 cm x 1.5 cm irregularly shaped, lobulated, narrow based mass medial and caudal to the dorsal aspect of the right pinna. The surface of the mass was ulcerated. A complete blood count and serum chemistry were within normal limits. One week after presentation, the mass was excised with blunt and sharp dissection to elevate and remove the mass. The mass was confined to skin, which was closed after the excision; the animal recovered routinely. Histopathology revealed a circumscribed mass composed of ribbons, cords, and tubular formations of basal epithelial cells. The stroma was composed of dense fibrous bands with small mucinous zones and mildly irregularly distributed chronic inflammation, consistent with a basal cell tumor with a garland pattern. Basal cell tumors are very common skin tumors in the human population; most tumors are confined to the face, ears, neck, scalp, shoulders, or back, and have been linked to previous sun exposure. There are 4 prior reports of basal cell tumors in nonhuman primates; this report is novel in that the tumor is actually confined to an area of the body consistent with the most common form of the disease in humans. In previous reports the animals were also wild caught and actual exposure history and age of the animal were unknown.

Physiological and Behavioral Effects of Social Introduction on Adult Male Rhesus Macaques (*Macaca mula a*)

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Pair housing of laboratory macaques is widely considered to lead to positive changes in well-being, yet the process of introduction is viewed as potentially stressful and risk-prone. Behavioral and physiological data were collected on 8 adult male rhesus macaques before, during, and after the process of introduction in order to measure both the initial stress of introduction and long-term changes in well-being. Previously corral-housed subjects, all implanted with biotelemetry devices, were studied in five successive phases: baseline (single housing), 1 d each of protected contact and full contact introduction, post-introduction (1–3 wk after introduction), and settled pairs (≥20 wk after introduction). We coded 176 h of focal animal behavioral data and analyzed 40 h of heart rate data. Fecal cortisol levels were also measured for the baseline, post-introduction and settled-pair phases. All introductions were successful and the process of social introduction showed no physiological or behavioral signs of stress, such as increased heart rate or elevations in depressive, anxiety, or abnormal behaviors. Agonism was minimal throughout the introduction process and over the subsequent months; only 1 wound was incurred over the course of the study. Both short- and long-term improvements in levels of depressive, locomotor, and affiliative behavior were observed. Cortisol levels were significantly lower than baseline in the post-introduction and settled pair phases. Abnormal behavior fell during and after introductions, but this reduction did not persist long-term and may have been confounded by increasing duration of time spent caged. Heart rate varied predictably over the course of each day but not over study phases. The outcome of introductions and long-term improvements in well-being suggest that managers should not be hesitant to introduce adult male rhesus macaques into pairs. The results of this study may be of practical use for designing and monitoring social introductions.

Multiple Congenital Deformities in a Newborn Rhesus Macaque (*Macaca mula a*)

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A newborn female rhesus macaque (*Macaca mula a*) was presented from outdoor corral housing the morning following birth with an abnormal appearance and overall ill thrift. Upon examination, a midline defect was noted extending from the umbilicus to the chin of the infant, with only a thin layer of tissue covering the thoracic viscera. The newborn was significantly depressed and displayed labored respiration. Due to the severity of the defect and the grave state of the patient, humane euthanasia was pursued. At necropsy gross lesions included sternoschisis, scoliosis, and a markedly arched palate. While in many human cases of sternal clefts there are concurrent cardiac defects, such as ectopia cordis, no cardiac anomalies were noted in this macaque. Possible defects in embryology leading to these congenital abnormalities will be presented, and treatment options and prognosis in human patients with sternoschisis will be discussed.

Gestational Trophoblastic Disease in an Adult Female Cynomolgus Macaque (*Macaca fascicularis*)

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An adult female cynomolgus macaque was evaluated for lethargy and dehydration. Results of blood work were unremarkable, and diarrhea was suspected as the cause of the dehydration. The animal's clinical signs improved the day after admission, but declined dramatically by the third day and the animal was euthanized. At necropsy, a sessile uterine mass was identified in the wall of the uterine body, with a portion of the mass extending into the lumen. The mass was approximately 5 cm in diameter, yellowish-white, and friable in the center. Multiple, multifocal coalescing metastatic nodules of similar appearance were detected in the lungs, with effacement of approximately 80% of the normal lung parenchyma. Few metastases were also detected in the liver and spleen. On the basis of histologic appearance of the uterine mass and select immunohistochemical stains, the mass was tentatively identified as a placental site trophoblastic tumor (PSTT). Placental site trophoblastic tumor is one of the gestational trophoblastic diseases. PSTT is a neoplasm of the implantation site commonly following normal pregnancy or abortion. Sex chromosome evaluation suggests that the paternal X chromosome is involved in the development of these tumors.

Compliant Housing of Nonhuman Primates in Preclinical Safety Testing

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Although the number of nonhuman primates (NHPs) used for biomedical research is relatively small, the issues which need to be addressed in the discussion of their housing are particularly complex. For toxicology and pharmacology studies, housing and husbandry systems for NHPs should allow the control of as many external variables as possible while facilitating the recording of experimental observations and measurements. The housing should allow easy identification and capture of animals, clear observation and recording of data, and be easy to maintain hygienically. To enhance animal welfare and fulfill morphological, physiological, psychological, and social requirements, a cage design with extended floor area and cage

volume as well as furniture, flexibility, and feeding provisions was designed and optimized through several generations of prototypes in cooperation with manufacturers, technicians, scientists, and veterinarians. In designing such a cage. factors such as sexual dimorphism, age, size, and group dynamics have to be considered. In pharmacological or toxicological investigations, it may be necessary to administer test substances, collect blood samples, and monitor aspects of metabolism over days. The type of procedures and the degree of human intervention involved may affect the type of housing required.

Diagnosis and Treatment of Nephrotic Syndrome in a Male Captive Chimpanzee (*Pan troglodytes*)

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Renal disease represents the second leading cause of death in captive chimpanzees and a significant cause of morbidity at Alamogordo Primate Facility (APF). Glomerulonephropathy is the most commonly diagnosed renal abnormality at APF. Nephrotic syndrome is a chronic, progressive clinical sign complex that consists of proteinuria, hypoalbuminemia, hypercholesterolemia, and dependent edema. We present a clinical case in a 32-y-old male chimpanzee (non-infectious), initially observed by animal care staff to have mild bilateral swelling proximal to the tibiotarsal joint. An annual physical examination revealed minimal dependant edema, increased blood cholesterol, and hypoalbuminemia. A subsequent urinalysis showed proteinuria and an increased urine protein to creatinine ratio, demonstrating impaired glomerular filtration. Initially, Lasix (furosemide, 50 mg) was used to control the dependent edema, followed by a treatment regimen of enalapril (10 mg), Lipitor (atorvastatin calcium, 10 mg), and aspirin (243 mg), plus a high-protein, low-sodium diet. Weekly free-catch urine samples are used to monitor the level of proteinuria. We conclude that renal disease, specifically glomerulopathy and nephrotic syndrome, can be medically managed in captive chimpanzee populations.

Fluid-filled Cyst in the Caudal Abdomen of a Rhesus Macaque (*Macaca mula a*)

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A 17-y-old female, rhesus macaque with a history of intermittent reports of anorexia and an 8-y history of use in reproductive research involving ovarian stimulation and laparoscopic oocyte retrieval presented with an enlarged, irregular, and very firm uterus on abdominal and rectal palpation during a routine exam. Abdominal ultrasound revealed a fluid-filled cyst adjacent to the right ovary. Endometriosis was suspected, but aspiration of the fluid within the cyst resulted in an unexpected diagnosis.

Visceral and Neural Larva Migrans in Rhesus Macaques (*Macaca mula a*)

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Large ascarid larvae within granulomas were noted histologically in the mesenteric and pancreatic lymph nodes of 13 out of 21 rhesus macaques (*Macaca mula a*) euthanized as part of an experimental viral vaccine study. In addition, 4 of the 13 monkeys had cerebral granulomas containing nematode larvae similar to those within the lymph nodes. Despite the lesions, the animals did not show clinical signs associated with the parasitic infections. Characteristics of the larvae observed included, on cross-section, a mid-body diameter of approximately 60 to 80 µm, a centrally located and slightly compressed intestine flanked on either side by large triangular excretory columns, and prominent single lateral cuticular alae. The morphology of the larvae was compatible with *Baylisascaris* species. Baylisascariasis is a well-described infection in animals and humans caused by ingestion of the eggs of the raccoon roundworm, *Baylisascaris procyonis*. A similar species, *B columnaris*, is found in skunks and can also cause cerebrospinal nematodiasis; however, most reported cases have been due to *B procyonis*. In our cases the macaques were born free-ranging on an island in the southeastern US where raccoons, but not skunks, were found to be common inhabitants, suggesting that *B procyonis* was the parasite involved. These cases are examples of low-level or covert *Baylisascaris* infection as described in humans, and provide further evidence of the existence of this parasite in the southeastern US. Cases of clinical neurologic disease would be possible in this colony if any macaques become infected with higher dosages of eggs.

Husbandry and Veterinary Procedures for a BSL-3 Macaque Facility

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This presentation will review the husbandry and veterinary procedures developed to support a Biosafety Level 3 (BSL-3) facility designed for infectious disease research in macaques. The facility contains 2 animal rooms that together house up to 28 macaques, 2 research laboratories, a necropsy room, and various support areas. Procedures to be discussed include: steps to enter and exit the facility, disinfection of equipment and surfaces, cage cleaning and sanitization schedule, decontamination during and after completion of a study, collection of biological samples, and disinfection during necropsy. The presentation will specifically discuss these topics in relation to a project that involved infection with the monkeypox virus. In addition, a brief overview of the disease course and endpoint criteria will be provided.

Unusual Cases

New Innovations in Primary Housing for Great Apes

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This presentation will detail a number of innovations in a newly designed primary housing cage for chimpanzees and other large great apes. The design resulted from a collaborative effort between members of the Centers For Disease Control and Britz & Company (formerly BH, Inc.). The innovations involve primarily the safety for both the housed animal and the caregivers, and the comfort and environmental enrichment for the caged animal while meeting all the requirements for housing these species. Specifically, these innovations include a modularized construction, a newly designed motor-driven full back panel squeeze mecha-

nism, a different approach to the design of guillotine doors, a secure connection for easily attaching transfer units to the main cage, and enrichment additions for food presentation, resting boards, and the attachment of blood drawing sleeves and manipulata.

Invasive Primate Neuroscience: Is More Regulation or Better Management the Key to Success?

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The UK has a reputation for having some of the strictest regulations in the world governing the use of nonhuman primates in research. The rationale for this is that the work will then be better justified, carried out to higher standards and result in better science and better animal welfare. However, the primary key to ensuring the research that takes place is strongly justified and ethically sound is a strong institutional management system, which can be an anachronism in some sections of academia. This case study will illustrate many of the challenges associated with providing good quality veterinary care and behavioral management for primates on neuroscience projects. We will show how use of the various levels of communication open to us can achieve long-term benefits in animal welfare and scientific output and a reduction in reputational risk to the institution. We will demonstrate that more regulation is not always better regulation, and that it is the institution's culture of care that makes the difference.

Surgical Placement of Vascular Access Ports in Common Marmosets, Lessons Learned

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Common marmosets were chosen as a primate model for pharmacokinetic (PK) studies. To facilitate taking multiple blood samples in these studies, vascular access ports (VAPS) were implanted. Originally only the femoral artery was catheterized, but as the surgery became more routine we placed two VAPS—one in the femoral artery and one in the femoral vein. This is only the second report of successful vascular access port placement in the marmoset. The first report used the VAP solely to administer drugs and, VAPS only remained in place for three weeks. In our study, male marmosets weighing 250-400 grams were implanted with vascular access ports. Port heads made of titanium and polysulfone were placed subcutaneously in the dorsal lumbar area. The VAPS had hydromer coated and heparin coated 3-3.5 French polyurethane catheters attached. The profile of the port head was an important consideration for increasing port longevity. Catheters were locked with a taurolidine-citrate catheter solution during surgery. Catheters are maintained weekly and locked with heparin. Two of the challenges with this model included weight loss and tissue necrosis over the port heads. To minimize weight loss, we provided our marmosets with dietary supplementation that included fortified baby cereal, human nutritional supplement drinks, yogurt, and acacia gum with added protein. To reduce the incidence of tissue necrosis we used a VAP with a lower profile port head. We presently have a colony of 9 ported marmosets. The marmosets have been used successfully twice a month on studies without adverse effects.

CDC's Role in Regulating the Importation and Quarantine of Nonhuman Primates

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The importation of nonhuman primates has been controlled by the Centers for Disease Control and Prevention (CDC) since 1975. Regulations were implemented in response to concerns about Ebola-Marburg, monkeypox, yellow fever, and tuberculosis. Following an outbreak of Ebola-Reston in imported cynomolgus macaques in 1989-1990, the requirements to import nonhuman primates were strengthened. This presentation provides an overview of CDC regulations regarding the importation of live nonhuman primates, the scientific rationale for quarantine requirements, and current data on the numbers of registered importers, species and animals imported, and countries of origin. To ensure safe handling of nonhuman primates and compliance with federal quarantine regulations, CDC requires importers to register and provide advance notice of all shipments of animals. As part of becoming a registered importer, CDC requires that each facility submit import plans, disease control measures, standard operating procedures, and facility information for review. In addition, the CDC Division of Global Migration and Quarantine's Zoonoses Team inspects the facilities of each registered importer, monitors shipments of imported animals, and keeps records of numbers and sources of animals imported, as well as morbidity and mortality data. Once registered, an importer must inform CDC about arrival dates, flights, number of animals, ports of entry, ground transport, source, and any illness or death that occurred during transportation or at any time during the quarantine period. Imported animals must be quarantined for a minimum of 31 days, monitored for signs of disease, and treated or tested as necessary. Filovirus infections (including Ebola and Marburg) are primary zoonoses of concern; both have an incubation period of 14 days. Thus, the 31-day quarantine requirement ensures that animals released from quarantine do not pose a risk for transmission of these viral hemorrhagic fevers. Additionally, each animal must have three consecutive negative tuberculin skin tests administered at two-week intervals before release from quarantine. If initiated early, these tests can be completed during the minimum required 31-day period. If any animals test positive for tuberculosis during quarantine, the entire cohort must be held in extended quarantine and undergo additional testing to rule out tuberculosis. Since the CDC regulations were instituted, the health of imported nonhuman primates has improved steadily, and morbidity and mortality rates among them have declined to less than one percent, greatly decreasing the risk to public health. These regulations provide the basis for ensuring that imported nonhuman primates do not pose a zoonotic disease risk.

Diagnostics 101: A Laboratory-users' Guide to Pathogen Testing in Nonhuman Primates

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For reasons of animal health, occupational safety, and research integrity, the testing of nonhuman primates for a variety of infectious agents has become a mainstay of sound colony management for animals used in biomedical research. Testing for targeted agents often involves indirect methods such as antibody detection, direct methods that detect the actual pathogen or some combination of both. The veterinarian or colony manager is

frequently faced with a daunting array of choices when requesting services from a testing laboratory. Equally daunting is the task of translating test results into management decisions. This seminar will provide an overview of some basic concepts underlying laboratory testing of nonhuman primates. Topics will include a discussion of the various types of tests (e.g. screening vs. diagnostic; EIA, IFA, immunoblot, culture, PCR) and the strengths and limitations of each; test characteristics such as sensitivity, specificity, and predictive value; test validation and development of interpretive criteria; and the development of testing algorithms that utilize multiple tests. The objective of this seminar is to provide the veterinarian or colony manager with basic information about diagnostic tests and the testing process that can serve as the basis for improving communication between those charged with utilizing test results and those charged with generating them.

Cardiac Disease in New World Monkeys

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Cardiovascular diseases in New World monkeys are much more prevalent than what has been reported in the literature. Among the neotropical primates, the owl monkey is well-known for developing cardiomyopathy in captivity. Clinically silent cardiovascular pathology is also found in tamarins and squirrel monkeys. It is very likely that most primate species suffer from some degree of cardiovascular disease in captivity. This has been overlooked because most cases are subclinical, and at microscopic examination, in many instances, subtle changes are observed. Evaluation of heart function in monkeys using cardiac enzymatic activity is problematic because although published values exist for CK, AST, and LDH in some primate species—particularly macaques—there are no validated reference values for healthy animals. Most of the values reported have a wide range, and it is difficult to know if these values reflect a healthy population. The sampled animals are described as "clinically healthy," but because they rarely show clinical signs of disease, particularly cardiac disease, they may not be. In addition, there are no published "normal" reference values for CK/AST ratio in nonhuman species, which is useful for the diagnosis of myocardial infarcts in humans, because the CK/AST ratio is not used in veterinary medicine. Although hypertension is suspected as the primary cause of cardiomyopathy in captive monkeys, it is difficult to prove, due to a lack of information on "normal" blood pressure values for nonhuman primates. Echocardiography, electrocardiograms, and X-rays have all been used, but do not clearly identify monkeys with early cardiac disease. In addition, myocardial infarction can occur with normal coronary arteries. The possible mechanisms causing myocardial infarction with normal coronary arteries are hypercoagulable states, coronary embolism, imbalance between oxygen demand and supply, intense sympathetic stimulation, non-atherosclerotic coronary diseases, coronary trauma, coronary vasospasm, coronary thrombosis, and endothelial dysfunction. Cardiac disease in captive nonhuman primates is probably much more prevalent than originally thought, due to the difficulty of making an antemortem diagnosis because of a lack of specific criteria and validated normal reference values.

Nonhuman Primate Breeding in China: the Status and Prospective

WZ Fang

Although China has a long history of breeding nonhuman primates, it has become one of the largest suppliers of NHPs only in recent years. China's colony size has expanded rapidly from 2004, when the central government issued the Provision 124, to enforce the law and to introduce the market mechanism to the industry, setting up a quota system under which a sales quota is issued to every breeding farm according to its colony size and the productivity; thus, encouraging the farms to enlarge its size by acquisition or importation. Many high standard facilities were built, and the total colony size is up to 150,000, which consists of about 120 heads of cynomolgus, about 30 heads of rhesus, and the rest of other species, according to a recent survey conducted by the Chinese Laboratory Primate Association (CLPA), a nongovernmental entity which has over 40 breeding farms and related organizations as it members. CLPA acts as a bridge and liaison between the government and breeding farms, assists government to establish the quota system and supervise the market, and develops academic exchanges among members and end-users. With the favorable investment environment and availability of skilled people, China will supply more and more quality animal and seize the new opportunities in the CRO area.

The Dynamics of Endodontic Treatment

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There is no evidence-based protocol for pulp preservation or endodontic procedures for primates. Present literature is not enough to support standards for diagnosis and indication of treatment. What is in use now was adapted from humans. The endodontic specialty had a remarkable technological evolution focused on efficiency and speed of treatment in the past 10 years. This modernization reduced the chair time significantly and radicalized the procedures towards pulp elimination. Modern endodontics does not preserve pulp, but eliminates it. The basic principle of dentistry is still the same—preserve pulp vitality or seal the canal to prevent dead space from where infection can start. Pulp vitality and viability are directly related to tooth long-term survival. Pulpotomy or root canal are sensitive procedures and can fail after minor mistakes. To reduce the chances of mistakes, the adoption of the most accurate diagnostic system and least complicated protocol of treatment should be considered. In the 1980s the mutilating extractions and the failing of pulpal mummification using formocresol on cut canines due to its misuse spurred a search for a permanent solution. Mummification was used, and still is, to treat deciduous teeth with vital pulp exposed during dental procedures as a short-term treatment to prevent infection. The objectives of this presentation are to quickly review the scattered information available, discuss the pros and cons of different techniques, and start a discussion of a dedicated protocol for primate endodontics. The solution is flexibility of treatment with options for temporary (emergency), conservative (vital), permanent, and radical.

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Record of Participation in Continuing Education Program

35th Annual Workshop of the Association of Primate Veterinarians (APV), Oct. 11–13, 2007

This form is provided to attendees of the annual APV workshop as official documentation of attendance at the workshop. Attendees are advised to record their attendance at presentations and to supplement this information with a copy of the official program.

Every hour of participation in the seminars and scientific sessions of an APV workshop is potentially worth one hour of credit for documentation of continuing education. The 2007 workshop provides a total of **16** contact hours of continuing education. Additional information on the various state requirements of CE credits is available from the American Veterinary Medical Association (AVMA). Final determination of the acceptance of a program is up to the individual state licensing authority.

Marion Ratteree, Secretary

Print name of participant

Signature of participant

Signature of contact person/faculty

At the 2007 APV Workshop, I attended the following lectures and/or presentations:

- ❑ Effects of the Macrolide Drug Tylosin on Chronic Diarrhea in Rhesus Macaques, Rebecca S. BlackwoodP
- ❑ Treatment of Conjuctivitis by Subtenon Injection
- ❑ Using Fenbendazole in Commercial Non-Human Primate Diets and a Fecal Parasite Concentrator to Manage Intestinal Parasites in Macaques
- ❑ Asymptomatic Ependymal Cyst in Adult Cynomolgus Macaque
- ❑ Trichobezoar Prevention Using Soy Lecithin Supplementation in Galagos
- ❑ Urinary Alkalinization in the Treatment of Traumatic Rhabdomyolysis in Rhesus Macaques
- ❑ Localized Allergic Dermatitis Treated with Tacrolimus Ointment in a Rhesus Macaque
- ❑ Acute Anorexia and Lethargy Associated with Pyrexia in an Adult Rhesus Macaque
- ❑ Fractures Associated with a Breeding Colony of SPF Cynomolgus Monkeys
- ❑ Stress Cardiomyopthy Following Severe Soft Tissue Trauma in a Chimpanzee
- ❑ Calcinosis Cutis in Rhesus Macaques Associated with Trauma
- ❑ Adenocarcinoma in a Chimpanzee
- ❑ Management of Iatrogenic Hypoglycemic Coma in a Rhesus Macaque
- ❑ Psychosocial Stress and Diet Choice
- ❑ Acute Renal Failure Associated with Sepsis in Three Rhesus Macaques
- ❑ Diagonstic 101: A Laboratory Users' Guide to Pathogen Testing in Nonhuman Primates
- ❑ Round-table Discussion: Clinical
- ❑ Round-table Discussion: Management
- ❑ Techniques for Treating Vaginal Prolapses
- ❑ Determining Efficacy of Post-endoscopic Biopsy Treatment with Sucralfate on Appetite in Nonhuman Primates
- ❑ Non-Invasive Blood Pressure Determination for Continuous Anaesthesia Monitoring in Nonhuman Primates
- ❑ Molecular Epidermicological Investigation of Simian Varicella Virus Infection in Two Immunocompromised Rhesus Macaques
- ❑ Some Advances from the Use of Macaques in Gene Therapy
- ❑ Limitations of Measles Diagnostic Testing in Rhesus Macaques
- ❑ Colonoscopy in Rhesus Macaques—Principles, Procedures, and Problems,
- ❑ Herpes B Update
- ❑ Persistent Conjunctivitis in a Rhesus Macaque
- ❑ Focal Pyogranulomatous Encephalitis in a Rhesus Macaque
- ❑ Failure to Thrive in a Cynomolgus Monkey
- ❑ Abdominal Mass in a Squirrel Monkey
- ❑ Round-table Discussion: Cardiac Disease in New World Monkeys
- ❑ Round-table Discussion: Cardiomyopathy in Captive Chimpanzees
- ❑ Irregular Cutaneous Scalp Mass in a Rhesus Macaque
- ❑ Physiological and Behavioral Effects of Social Introduction on Adult Male Rhesus Macaques
- ❑ Multiple Congenital Deformities Including Sternoschisis and Scoliosis in a Newborn Rhesus Macaque
- ❑ Gestational Trophoblastic Disease in an Adult Female Cynomolgus Macaque
- ❑ Compliant Housing of Nonhuman Primates in Preclinical Safety Testing
- ❑ Diagnosis and Treatment of Nephrotic Syndrome in a Male Captive Chimpanzee
- ❑ Fluid-Filled Cyst in the Caudal Abdomen of a Rhesus Macaque
- ❑ Visceral and Nerual Larva Migrans in Rhesus Macques
- ❑ Husbandry and Veterinary Procedures for a BSL-3 Macaque Facility
- ❑ The Dynamics of Endodonic Treatment
- ❑ New Innovations in Primary Housing for Great Apes
- ❑ Invasive Primate Neuroscience: Is More Regulation or Better Management the Key to Success?
- ❑ Surgical Placement of Vascular Access Ports in Common Marmosets
- ❑ NHP Breeding in China: the Status and Prospective
- ❑ AMP Update
- ❑ Journal of Medical Primatology: Proceedings and Publications
- ❑ ILAR's International Primate Plan

Application is pending to have this program approved by the American Association of Veterinary State Boards (AAVSB) RACE Program for Continuing Education. Please contact AAVSB's RACE Program at 3100 Main Street, Suite 208, Kansas City, MO, 64111 or info@aavsb.org should you have any comments or suggestions regarding this program.