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Nontraditional Dentistry
The Lion's Share of Dental Misery

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Veterinary Dentistry
Preserving Exotic Animals Through Clinical Care, Research, Education, and Teamwork

by

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Ron Whitfield, a lion trainer at the Marine World Africa/USA park, just south of San Francisco, is one of only two or three men in the world to work a group of ***all male*** lions. Whitfield himself owns twelve male lions and four tigers. He "affection trains" his cats to do things that others claim can't be done. For instance, Whitfield's Masai and Derrick are the only two lions in the world who can do the hind-leg walk.

Whitfield's regimen with his cats consists of daily keeping, training, and show performances. This has given him ample opportunity to observe changes in the cats' behavior and to theorize on the causes. It was Whitfield who first noticed a marked change in the behavior of a lion after it broke a tooth, and Whitfield's wife, Roxanne, a former dental assistant who now works with her husband and their cats, who argued long and hard in favor of fixing the broken canine tooth. Broken canine teeth are not unusual among the large felids.

"Since male lions spend the majority of their waking hours looking for a fight, Dr. Dinnes (the Whitfields' veterinarian) and I have treated most of the pride over the years," said David A. Fagan, DDS, a veterinary dentist who has specialized in the study of oral diseases in exotic animals for the past 13 years, and who was called in to treat Whitfield's ailing lion.

Whitfield attributes the problem to the chain-link housing and to the cats' boredom during the winter, when the weather does not allow daily training and mental and physical exercise. The cats chew or pull on the chain link, weakening or breaking off their canine teeth. During rough play or a fight, the weakened teeth then break off.

The behavioral changes in Whitfield's lions did not appear immediately. The cats licked and salivated more than usual for several days, until the exposed nerve tissue hanging out of the tooth broke off below the fracture line. Then, gradually, the lions did exhibit behavioral changes. In six of the cats, these changes became noticeable within three to six months of the break. In five other cases, the lions did not exhibit behavioral changes at all, although, since Whitfield always had obtained medical and dental care for the cats as soon as possible after the break, it is possible that some of the lions would have exhibited changes later, had they not received treatment. Among the behaviors that changed were the lions' eating habits.

" Although they never lost their voracious appetites, their normal method of eating change," Whitfield said. "The time they took to consume their food doubled, sometimes tripled, especially when they were given bone-in horsemeat. They tended to shear meat with the carnassial teeth opposite the broken canine. The lions left intact bones which the would normally have crushed and eaten."

Their personalities and social habits also changed. They became agitated and aggressive more readily, not only to Whitfield, but also to the other cats. "They rubbed muzzles and licked faces (the standard greeting procedure among the lions) less frequently or stopped altogether. The cat with the broken canine tooth would become agitated and would want to be left alone. The healthy lions, sensing a change or weakness, would pick fights with the injured cat more often," Whitfield said.

Finally, the cats also exhibited changes in show performances and in training. Their response times for trained behaviors became longer, sometimes two or three times the norm. One cat refused to perform altogether. The cats grumbled, snapped, barked, and snarled at Whitfield — although as healthy cats they had never been aggressive toward him — and did not want to be touched or handled. Laboratory reports on blood samples taken from four of the affected cats showed that each had a low-grade infection. Whitfield attributes the behavioral changes to the broken canines, which created a direct channel for bacteria to enter

the animal's circulatory system, resulting in abscesses and systemic infection. In each case, the lion's abnormal behavior gradually disappeared three to four weeks after it had received comprehensive root canal and restorative therapy.

The Practice

There is an unappreciated luxury in the practice of medical care with humans. The patient shows up at your office by appointment and tells you what's wrong. It is usually easy to institute the various tests necessary to confirm your diagnosis, make your prognosis, and proceed to treat the case.

This is not the case in veterinary medicine, however, and especially not in veterinary dentistry. Animals hide their problems. Attempts to obtain routine medical laboratory analysis — a blood sample, for instance — could lead to the animal's death. If you think that humans don't like having blood samples drawn, imagine drawing blood from a dolphin. You have to beach him, restrain him, and then the blood levels you will rely upon will be those associated with severe traumatic and psychological stress, certainly not ideal baseline data. The simplest tasks can assume enormous complexity whenever animals are involved.

It isn't surprising that most people believe that "animals don't have cavities." In fact, animals *don't* have many "cavities." In my 13 years of clinical experience with animals, I have seen fewer than a dozen cases of tooth decay. On the surface, there appears to be little economic or practical justification for a field of veterinary dentistry. It doesn't require much exposure to carnivores, however, whether captive or in the wild, to realize that this assumption is wrong.

Animals more than humans, depend upon the successful operation of their masticatory apparatus. When the mouth ceases to function properly, the animal can be rendered helpless, and is certainly rendered a disadvantage with respect to its position in its social hierarchy. The oral cavity is the entry mechanism to the digestive system. Without the ability to consume nutrients, the entire mammalian biochemical system ceases to function.

Several hundred organizations in the world purport to be engaged in the business of preserving endangered animals. There's an organization to save just about every species, including the seals, the goats on the Catalina islands, the snail darter, the California condor, and so on. Most of these organizations have noble objectives and certainly have a right to exist. The problems associated with each

species tend to be very species specific, however, and the administrative effort spent to address these problems is often duplicated. The last thing that is needed is a group of dentist, who are *not licensed* to practice with animals, placing cosmetic restorations for reasons that benefit their dental practices more than the health of the animals.

The Problems and Challenges

We all know that oral infections can lead to chronic intermittent bacteremia. Certainly the American Heart Association has done its best to teach us about the potential dangers of bacteremia, bacterial endocarditis, and the other systemic health hazards. But despite these warnings, dentistry remains a site-specific profession. Anyone who has had a toothache or has treated somebody with a toothache knows exactly where the problem is. "It hurts right here, Doc. This is the tooth that's causing the pain."

Animals don't have the luxury of such vocal specificity. Moreover, displaying a medical or dental weakness jeopardizes their social status. Consequently their ability to eat and to maintain themselves and their family units suffers. The result is that animals hide their medical ailments. They actually incubate their disorders. The diseases then progress to their natural conclusions, as much as they did in humans before the discovery of antibiotics.

What began as an oral infection ends by invading the entire body. Unlike the case in humans, the primary manifestations of oral disease in exotic animals are systemic disorders, such as kidney failure, acute interstitial nephritis, bacterial endocarditis, and/or bacterial arthritis, rather than facial pain. Fifty percent of the bacterial endocarditis problems in domestic dogs are related to the *Streptococcus viridans* group of microorganisms, which are primarily oral. Oral disease in animals can result in major systemic physical disorders, including the inability to reproduce and even death. Thus, dentists who treat oral disease in animals must have the general knowledge of a physician and the medical license of a veterinarian. That's the problem.

The clinical practice of veterinary dentistry spans the entire scope and breadth of the traditional dental practice (the domain of the dentist); all the general medical procedures and training of the physician/internist (the domain of the physician); and the anesthetic, medical, and animal husbandry management skills that are specific to the practice of veterinary medicine (the domain of the

veterinarian). ***Only*** the veterinarian, however, is licensed to provide the necessary care. The dentist's role in veterinary dentistry is that of a member of a team, and not the primary member of the team. The dentist is a hired gun, retained to provide specific knowledge and specific techniques on very specific issues.

If the difficulties associated with the practice of veterinary dentistry are many and compound, the rewards are equally grand. I can truly say that in 13 years of practicing dentistry with animals, I've never performed the same operation twice. I've completed similar procedures on many different species, but there is a big difference between performing the traditional endodontic procedure on the canine tooth of a marmoset, a tooth which is approximately the size of a straight pin, and that of a 500-pound male African lion, which has the internal volume of a 20-cc syringe.

Each case I've treated has varied according to the circumstances of the individual animal — the species specific circumstances, and the habitat and management circumstances. It's no wonder, then, that no two procedures were identical. The clinical management problems associated with elephants, for example, are clearly much greater than those associated with kinkajus or kangaroos or gorillas or domestic dogs. In short, there are no routine procedures. I view this as an asset, because it creates a tremendous challenge. For the inquisitive mind of the perpetual student or academician, this is good. But it also represents an enormous burden, an almost insurmountable obstacle, because the dentist must "reinvent the wheel" time and time again.

Your mailman can confirm that animals lead with their mouths. An animal's masticatory apparatus is subjected to a good deal of use, abuse, and trauma. The challenges of treating temporomandibular joint problems, facial trauma, maxillofacial surgical repair, endodontic procedures — all with a wide assortment of instruments — make the practice of veterinary dentistry one of the most challenging endeavors I can imagine.

The Process

Simply stated, all of the problems in animals relate to three factors: genetics, environment, and/or diet. This is similar to the case in humans. The difference, of course, is that humans can be taught to care for their teeth — to brush and floss at regular intervals, for example — whereas animals cannot.

This does not mean that preventative dentistry is not practical for animals. What it does suggest, however, is that the practice is different enough from the traditional delivery of dental care to humans to require new thought. The veterinary dentist must have a broader, more comprehensive perspective. As applied to animals, preventive dentistry is mainly a matter of modifying diet and/or environment, including living space and social problems. The desired result of preventive dentistry is always the same; it just has different staring points.

Consider the evolution of the diets of captive carnivores. By definition, lions and tigers eat fauna rather than flora. Traditionally, then, captive carnivores were fed carcasses or chunks of meat. As a result, gross dietary deficiencies developed in many of the animals in captivity, deficiencies like rickets and other nutritional secondary calcium/phosphorous imbalance disorders. Once the wildlife managers recognized these disorders, they promptly modified the diets. Now most captive carnivores eat a completely balanced, nutritionally sound, prepared diet. It is composed of the various nutrients and minerals and has a sufficient caloric content to support the animals' workload, which is actually a relatively sedentary workload. The difficulty we find now is that these predigested "TV dinners" do not provide enough "hassle factor" per mouthful of nutrients. This can result in an atrophy of the muscles of mastication, which, in turn, leads to other failures of the masticatory apparatus.

A veterinary dental practice should involve three basic processes: (1) appropriate and comprehensive clinical care; (2) research into relevant issues; and (3) education of the public, the veterinary medical profession, and the wildlife administrative community. To show how these three areas overlap and interdepend, I cite one of my first exotic animal cases, in 1971, with a camel at the Sacramento Zoo. I was asked to remove both of this animal's mandibular canine teeth. This was the ***clinical care***. What I discovery through ***research*** at the local museum was that the canine teth of the camel comprise 80 percent of the architectural support of the anterior portion of the mandible. If the canines are removed, the camel loses about 90 percent of the functional strength of this support system, meaning that the next time it bites something, its mandible will fracture. Third, I had to ***educate*** not only myself, which I had done, but also the veterinarians in charge of the case, the management of the zoo which owned the animal, and the keepers who took care of him. In the end, we had a team, pulling in the same direction and working as a single unit, but not without a good deal of time, effort, and preparation.

The Team

Veterinary dentistry is, by necessity, a cross-disciplinary field. Its main characteristic is the application of information and solutions from one field to another. Solutions that are no longer the most appropriate for human dental practice may turn out to be the most appropriate for animals, not because they are lesser solutions or less expensive or cost-effective solutions, but because they are solutions that lend themselves more specifically to the circumstances of that individual animal.

When all is said and done, the practice of veterinary dentistry requires a team. It is a multi disciplinary team. Led by the veterinarian, who assumes the primary responsibility for treatment of the individual animal. Only the veterinarian is licensed to provide all of the required care. That veterinarian may retain a dentist, an anesthesiologist, an anesthesia assistant, a dental assistant, a dental laboratory technician, a veterinary medical laboratory technician, and, of course, various administrative and hospital support staff.

The team has five or six elements, all of which must be present and functioning as a unit, much as the various systems of the body function as a unit. The reasons are fairly obvious. Veterinarians are in the business of providing medical care to their patients, as are dentists and physicians. They have forms to fill out; rents to pay; equipment payments to make; and decisions to make regarding equipment, size of the operating room, types of anesthesia, and so forth. The veterinarian's practice is every bit as complicated, if not more so, as that of the physician or the dentist. It involves all of the complex medical issues of both domestic animals and zoo animals. To compound the problem, the veterinarian must often take the hospital to the patient.

The dentist is essential to this team. Dentists are familiar with the various phases of dental care and with the delivery of that service. They know materials, equipment, instrumentations, supplies, setting times, mixing times, dependability, crushing strengths, shelf-life, and so on. The dentist provides greater depth and scope to the care delivered by the veterinarian.

Anesthesia is also an absolute requirement for the delivery of all veterinary care. The anesthesiologist maintains the life of the animal, and without the anesthesiologist, the whole effort is wasted. It's a good idea to fix teeth, but they aren't worth dying for.

All members of the veterinary dental team must be experienced in their respective fields, experienced in working together, and have respect for and comprehension of the other members' contributions and requirements.

The team also represents a medical/legal complexity. The veterinarian, who has primary responsibility, and the dentists and physicians all work on the same animal. From a legal point of view, each is licensed to practice in a particular area of medical specialty. But only the veterinarian is licensed by the state's medical board to provide care to animals. Consequently the delivery of the veterinary dental care comes after the anesthesiologist has declared it safe to proceed, and after the veterinarian has confirmed the overall health of the animal.

The Equipment

Not surprisingly, there is a tremendous amount of diversity in the equipment and instrumentation needed for veterinary dental practice. It is one thing to learn which instruments are appropriate for a 150- to 175-pound human. It is an altogether different matter to decide which instruments are going to be appropriate for a 1-pound marmoset or a 10,000-pound elephant. The entire instrumentation list of general dentistry must be scaled both up and down, if the veterinary dentist is to deliver adequate professional care.

Only about a third of the clinical practice of dentistry with animals falls within the range ordinarily served by the instruments and materials designed for human dental care. Consequently the veterinary dentist must be able to manufacture items and to suggest substitutions.

This requires creativity, which is a function of total knowledge — not just formal education, but years of personal experience. The point is that the successful practice of veterinary dentistry requires continual education, above and beyond that ordinarily residing in the new graduate dentist. A veterinary dentist must spend time (1) reading and combing through museums to understand comparative osteology and comparative functional anatomy of the masticatory apparatus, and (2) acquiring practical experience in the field of clinical dentistry.

Cautions

Many dental authorities contend that recent graduates should not immediately set up their own private practices, but rather should spend between

one and five years in a group practice, familiarizing themselves with the diversity of clinical practice. ***Veterinary Dentistry*** requires not only a good deal of creativity and a special blend of "outside" interests, but also experience, education, and continual learning, for which the dentist cannot expect to be rewarded in large financial returns.

The practice of veterinary dentistry is not the clinical practice for which one is qualified immediately after graduation from dental school. Many of those who "love animals and love medicine" think it's a logical extension to "love to deliver medicine to animals." If, in fact, that is want to do, then you should have been a veterinarian, not a dentist.

— On the Cover --

On the cover of this issue of *Dentistry 83*, clockwise from the left, are: Masai, an eight-year-old, 500-pound male lion; Janet Fagan, a veterinary dental assistant; and David A. Fagan, D.D.S. Working in an operating room at Marine World Africa/USA, the operating team of six, led by Dr. Marty Dinnes, veterinarian, have just begun the "standard" one-appointment endodontic/periodontic/restorative treatment that Dr. Fagan has developed for large carnivores.

While Janet holds Masai's lip out of the way, Dr. Fagan uses a high-speed air rotor hand piece to remove tooth structure and gain access to the pulp canal chamber of the lion's upper right third incisor, which has been traumatically fractured. The orange object in Masai's mouth is the intubation tube, which transports the anesthetic gas from the anesthetic machine to the lion's lungs. The small round object in the front is a high-intensity light source.