

MANAGEMENT OF A RHINOCEROS MEDICAL PROBLEM
WITHOUT BEHAVIORAL CONDITIONING
AND THE SUBSEQUENT DEVELOPMENT OF A CONDITIONING PROGRAM

By

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MABANZU - A CASE HISTORY

In 1989 the Dallas Zoo received a pair of Southern Black Rhinos (Diceros bicornis minor) from Zimbabwe. The female, Mabanzu, was of an undetermined age, and was pregnant at the time of capture. She delivered a healthy female calf at the Dallas Zoo on 28 February 1990 and reared her with no difficulty. While in captivity, Mabanzu proved to be excitable, unpredictable, and aggressive at times. Keepers acclimatized her to hand feeding and limited touching, but otherwise interactions with Mabanzu remained restrained.

A review of Mabanzu's medical history at the Dallas Zoo revealed a few minor problems. Specifically, the loss of her front horn during shipment, an infection around her Zimbabwe ear tag, periodic bouts of diarrhea and/or soft stools, and a laceration on the lower lip. Typically, prescribed medications were administered in apples unless the medication was discovered and the food rejected. If rejected, then apples and other produce items were used to lure Mabanzu close enough to administer medications orally while she held her mouth open to accept the food. At times, Mabanzu refused to approach or accept food from the keepers and administration of medication became problematic.

After separation from her first captive born calf, Mabanzu was placed with the male for breeding. Daily introduction to the male was terminated once pregnancy was suspected and confirmed by fecal hormone analysis. Mabanzu was shifted into a yard that was not adjacent to the male's yard. Mabanzu's behavior after separation from the adult male was slightly atypical. She became quieter and less mobile. Because these behaviors were not overt, changes were attributed to her isolation, relocation, and pregnancy. In the spring of 1994, keepers and research aides first noted that she shifted her weight quite often and sometimes stood with the sole of one foot lifted while the toes were rested on the ground. Since she showed no signs of ambulatory lameness and no physical signs of injury or disease, her behavior was attributed to her pregnancy and possible resulting discomfort. The relationship between the keepers and Mabanzu became more relaxed during this time frame. Most notably, as her behavior changed she would allow closer visual examination and some touching. However, her trust remained limited and she normally maintained a head-on, perpendicular stance to the keeper when in close proximity, restricting visual and tactile examination.

Mabanzu's weight shifting behavior and more placid demeanor continued after the birth of her second calf in captivity on 3 July 1994. By 8 December 1994, her weight shifting had accelerated to a point where Banamine® was prescribed for her apparent discomfort, although no physical causes were observed. Two days later, the keeper noted a quarter sized black spot on the pad of one hind foot, and observed that both mother and calf were spending most of the day lying down. She began to appear physically exhausted, responding slowly to stimuli and standing with her head held down. Five days later, Mabanzu showed difficulty in walking. She limited her movement to slow, small steps. She also spent the majority of her time lying down, and was having difficulty rising to a standing position.

The Banamine® treatments seemed to relieve Mabanzu's weight shifting and improved her mobility.

As a keeper occupied Mabanzu with produce on 27 December 1994 our senior veterinarian noted a papillomatous lesion on the carpal area of both front legs. The lesions measured approximately 2.5 - 5.1 cm in diameter and consisted of multiple, small, finger-like, dermal projections. The following day he observed skin growths between the toes of three feet and noted a small infection between two toes. The condition was diagnosed as chronic hyperkeratotic dermatitis (abnormally excessive proliferation of the epidermis) and an antibiotic regimen was initiated. Visual examination of her interdigital spaces and soles were made daily as her positioning allowed. Interdigital spaces were examined while the rhino stood close to the fence for feeding, and the soles were examined in the morning while she was lying down in the barn. By 29 December 1994, the black spot on the sole of the hind foot had enlarged to encompass the pad area directly under the interdigital spaces. Two sores were noted on her right foreleg three days later and another appeared above the center hoof of the right rear foot the following day. A full immobilization was performed on 19 January 1995 in order to examine her feet in detail.

The first immobilization revealed severe necrotizing pododermatitis (foot rot) in the interdigital spaces and on the soles of all four feet. A regimen of treatments was planned while samples were sent for culture. One treatment involved soaking the feet for 20 to 30 minutes. Because Mabanzu was unaccustomed to intense interaction or restraint in a chute, the first foot soak was performed as a standing sedation. While her calf was held separately in the barn, a head rope was used to guide Mabanzu into the chute from the barn. Once in the chute, shallow rubber tubs were placed under each foot and filled with a 15% solution of zinc sulfate and warm water. The rubber tubs proved to be inadequate. When Mabanzu shifted forward or backward she would continually tip over the tubs and they had to be moved and refilled. Also, the potential for staff injury existed, as many arms had to be extended into the chute to monitor the tubs. To improve efficiency and safety, a shallow wooden footbath was designed and constructed to fit within the existing restraint chute. Before introduction of the footbath, keepers placed rubber mats and cargo blankets in the chute to acclimatize Mabanzu to their presence and feel since they were to be used in the bath to provide padding and traction.

The wooden footbath was introduced on 19 February 1995 for a successful dry run and again the next day for a foot soak. The procedure was again performed under a standing sedation and Mabanzu was guided with a head rope into the bath, which was filled with a 2.5% solution of Nolvasan® and warm water. Because of Mabanzu's increasingly lethargic demeanor, we were able to conduct the third and all consequent foot soaks without sedation and without a head rope. By offering produce and grain, Mabanzu was gradually encouraged out of the barn and into the footbath. She spent an average of 30 minutes in the footbath under her own will. While there, the keepers treated her drying skin with a 50% solution of bath oil and warm water. Over the next week both the duration of time spent in the footbath and Mabanzu's willingness to enter increased. Despite the success in getting Mabanzu to cooperate, the treatment had no effect and was discontinued after one week. However, the potential for future use of this apparatus seemed promising.

Over a period of two months, Mabanzu was immobilized eleven times for surgical procedures on her feet. At times her feet appeared to improve after treatment, and at others the infection seemed to have worsened. Concurrent with

Mabanzu's foot treatments, the staff was also trying to prevent a hemolytic crisis in Mabanzu. But unfortunately, after four weeks of intensive treatment, the first signs of hemolysis were seen. During one immobilization, an in-dwelling catheter was placed in one of her ear veins. Intravenous drugs were administered as many as four times per day by the veterinarians as the keepers calmly interacted with and/or hand fed Mabanzu. Due to immobilization schedules, Mabanzu was sometimes enticed with a salt block or physical contact, rather than with food, for intravenous injections.

During all procedures, her calf was held separately under a light dose of orally administered Haldol®. Signs of separation anxiety were detected only in that mother and calf vocalized to one another, both audibly and in infrasound (Bennett, unpublished data). A familiar keeper remained with the calf during all full immobilizations while all others assisted with the procedures on Mabanzu.

As her illness progressed, Mabanzu's exhausted behavior amplified. It became evident that her calf would have to be separated to reduce the strain of nursing and to allow for more aggressive therapeutic treatments. The calf was separated on 3 March 1995 at the age of eight months. Mabanzu's grain allotment was increased in hope that greater food consumption would combat her weight loss. Although Mabanzu continued to eat until her final day, her overall condition continued to deteriorate.

Mabanzu died on 22 March 1995, three days after her final immobilization. The ultimate cause of death was due to complications from a hemolytic crisis. During the three month long ordeal, keeper duties consisted of daily monitoring, administration of oral medications, measurement of food consumption, urine collection, hand feeding during veterinary examinations, cleaning, and barn preparation. After the initial surgical treatment on Mabanzu's feet, management practices were changed. The hay bed was enlarged to cover the entire barn and the thickness was increased. Rubber mats, placed on the barn floors, were used to provide additional cushioning. Pine shavings were spread on and around the mats to absorb any moisture. Mabanzu's access to the yard was restricted once bandages were placed on her feet post surgery. The weather was cold and wet at times, requiring a quick and efficient approach to barn cleaning and set up. All keepers in the section worked as a team to perform daily cleaning and to assist with the biweekly immobilizations.

Mabanzu's relative intractability, pregnancy, and the subsequent presence of a nursing calf complicated her diagnosis and treatment. During her illness, we were able to treat her on a daily basis mostly due to her lethargy. If she had been in a healthier state it is unlikely we would have been able to examine her as thoroughly, or perform treatments such as foot soaks. The difficulty in treating Mabanzu and her subsequent loss made it evident that we needed to gain greater control of our interactions with the zoo's other three rhinos.

CONDITIONING

When Tim Desmond of Active Environments arrived at the Dallas Zoo to begin working on a protected contact program for African elephants, the rhino keepers requested a meeting with him to discuss our ideas for conditioning rhinos. Tim made suggestions, gave encouragement, and facilitated the beginning of our existing program. One rhino keeper, Kevin Lew, had conditioning experience with other species, and was selected to be the leader of a team consisting of four people.

The team's first objective was to identify the goals of the conditioning program. These included desensitization to: physical touch on all parts of the body, varying numbers and identities of staff, and the presence of foreign items (e.g. veterinary equipment). Other goals were reaching a tolerance to standing in the restraint chutes, and preparation for blood draws without sedation. Specific behaviors we identified for shaping were: "target"- placing the nose on a provided target, "stay" - remain stationary on the target, "foot" - raise the front feet for examination, "foot/stay" - hold the foot up, or prop the foot on an object for detailed examination, "come here" - come to the keeper upon request, and "lean-in" - place the body horizontally along the fence. A seventh behavior was added after the conditioning was under way, "back" - walk backwards away from the keeper, and became useful in encouraging animals out of the chute, away from the target, or away from a particular area. A clicker was selected to act as the bridge and the daily allotment of 12 apples per rhino were chosen to be used as rewards due to the rhinos' preference for this fruit.

The first behavior to be shaped was "target". Our captive born female rhino, Zambezi, learned the behavior the first day we introduced it and was quickly advanced to "stay". The young captive born male, Indy, learned "target" within the first week and was also advanced to "stay". The wild caught male, Niki, learned "target" after greater exposure, and took a full three months to learn "stay" as opposed to the few weeks required by the other two rhinos. Niki was easily frustrated by the training exercises, so we had to reward him quickly and frequently to maintain his interest. Indy and Zambezi accepted the training more willingly and more vigorously, perhaps due to differential levels of keeper familiarity and relative comfort in captivity as opposed to the more nervous wild caught male.

The rhinos were first taught to go to the target, which was held by a keeper. Once they had accomplished this goal, they were taught to go to a target which was remotely placed on the railing in the yard or in the restraint chute (Indy and Zambezi only, Niki is still learning to "target" in the chute). The keepers placed greater and greater distance between themselves and the target as the rhinos progressed. Behavior in the chute was at first restless, the rhinos touched the targets, received a reward, and then backed out of the chute. As they became more comfortable in the chutes, the keepers started to desensitize them to movement, touch, and objects. At first these attempts also created a nervous response, but in time all were tolerated while the animal remained in the chute. After weeks of conditioning, we could access two of the rhinos from nose to tail on demand.

Because the design of our chutes allows us only unrestricted access to one side of the rhino, we wanted to teach the rhinos to expose their other side along the railing of the yard. In order to accomplish this goal, we introduced a head target and a hip target attached to poles. While Niki was still learning "stay", Indy and Zambezi were first taught to target on the new head target, and then were desensitized to the hip target. The hip target proved to be our first difficult challenge with Indy and Zambezi. Zambezi was especially wary of an objects moving behind her head. Indy preceded Zambezi for the first time in learning "lean-in", and was soon willing to perform the behavior on both sides. Zambezi proved to be reluctant in performing the behavior on both sides, but to our advantage the side on which she refused "lean-in" was the side to which we had access in the chute. We were now able to access both sides of two rhinos for the first time.

We came to realize that Niki learned at a different speed and in a different manner from the two rhinos raised in captivity. Once Niki learned "stay", his learning speed accelerated greatly. Because he showed a great reluctance to accept the hip target, we took advantage of his natural propensity to "lean-in" for rubbing, as recommended by Gail Laule (Active Environments). When Niki would "lean-in" of his own accord, we would introduce the head target, reward him with apples, and verbally reinforce him with the command. Niki quickly learned the desired behavior, but only on one side. Despite the limited access to Niki's one side, we now could visually and physically examine all three rhinos from nose to tail while they stayed on target.

We introduced "foot" once the rhinos were comfortable staying in the chute or in a "lean-in" position. At first we were perplexed about how to get the rhinos to lift their feet, until we learned that former Dallas Zoo keeper, Lonnie McCaskill, could get Zambezi to raise her feet by applying gentle pressure on her hocks. We combined hand pressure with the verbal command while Indy and Zambezi stayed on the target. At first we rewarded movement and gradually worked up to rewarding them when they lifted the foot completely off the ground. We also rewarded Indy's natural propensity to extend his foot forward and up, so that he could display his front feet in two different fashions. Next we introduced "foot/stay" as we helped to support the foot with our hands. To reduce the risk of keeper injury and to increase the amount of time for which the foot could be held up, we introduced a wooden box on which the rhinos could rest their bent leg. Both Indy and Zambezi could eventually stand for minutes at a time with the sole of the foot exposed for visual and tactile examination. We also desensitized them to tactile examination of their interdigital spaces.

Again, Niki learned in a different fashion. Niki learned "foot" before he learned "lean-in". Because he was only standing perpendicular to the keepers at this time, we used a long handled deck brush to tap the back of the leg we wished for him to raise while giving the command "foot". Niki quickly learned to hold his foot up without the physical prompt from the deck brush and progressed to respond to the use of hand signals. We eventually transitioned "foot" into "lean-in" once Niki had learned that behavior comfortably. We have tactile examination of one foot and visual examination of both of Niki's feet at this writing.

We introduced simulated blood draws on Indy and Zambezi prior to actual blood draws by the veterinary staff. In our simulations, we wash the legs, scrub the legs with a Betadine Surgi-Prep®, and using a blunt needle or paper clip, gently prod the skin on top of the medial metacarpal vein where it crosses over the inside of the metacarpal bone. We initially used a scrub without Betadine®, but the smell of the chemical proved to be a significant part of desensitization.

"Back" was initially introduced to facilitate Indy and Zambezi backing out of their respective chutes. The command was verbally given when the animals started walking backward on their own and was rewarded by tossing an apple piece at their feet. Once learned, it was introduced in the yard and has become a useful tool to remove these two rhinos from undesired close proximity to a person or object (e.g. when it becomes necessary to reach through the railings to introduce or remove an object from the yard or barn).

"Come here" was introduced at the same time as "stay". The rhinos were rewarded for coming to the keeper when called. This behavior was used to bring the rhinos into closer proximity for target training.

USE OF CONDITIONING

One use of the conditioning program was training Indy to "bowl" as a promotion for Bowling for Rhinos. We first desensitized him to a large Jungle Ball® and bowling pins. Next we set the ball up on a wooden track and rewarded Indy for nudging the ball. Within three days Indy was nudging the ball, and the ball was rolling down the track and hitting the bowling pins. Although time did not allow us to completely desensitize Indy to the crash of the bowling pins, he did bowl two strikes for the media on request.

We employed conditioned behaviors to calmly remove a severely weak neonate from Zambezi's stall while she was present. We subsequently used conditioning to steady the mother on the target while being milked by another keeper. These results will be discussed in further detail in another presentation at this conference. Moyo, Zambezi's calf born on 4 February 1997, is now mastering "stay". He was introduced to the target at the age of three months, and is conditioned concurrently with his mother.

On a less cheerful note, we are currently employing conditioned behaviors to draw blood on a weekly basis from Indy and Zambezi who are experiencing health problems. Their comfort levels in the chutes and their tolerance to touch have allowed us to treat sores and examine their feet for signs of excess skin growth and infection. We hope that these enhanced abilities will help us to achieve an earlier diagnosis of health problems, as opposed to our relative helplessness in cases like that of Mabanzu.

CONCLUSIONS

After two years of conditioning, we have been able to accomplish significantly more with the zoo's three rhinos than we did with Mabanzu. The progress of the wild caught male, Niki, who arrived in the same shipment as Mabanzu, is testimony to the powerful capabilities of a conditioning program. Our ability to examine, manage, diagnose, and treat our rhinos has improved immensely since the introduction of the training program. The level of trust shown by the rhinos has increased dramatically, enabling them to interact with the keepers in a much more comfortable manner. The behaviors shaped were behaviors normally displayed by the rhinos, but were not under control of the keepers. With the introduction of the conditioning program we can now ask for these behaviors to be displayed at a given time and for a specific purpose.

Since the inception of the conditioning program in September of 1995 we have accomplished all of our initial goals. We are constantly working to refine behaviors and add new ones. We have employed the learned behaviors to accomplish at least three different objectives: management of a newborn, treatment of an illness, and media promotions. One regret is that we did not choose to use a whistle as a bridge. Doing so may have been easier on the keepers by providing greater dexterity and flexibility of hand motion.

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PRODUCTS MENTIONNED IN TEXT

Banamine paste - Schering-Plough Animal Health Corp., Kenilworth, NJ 07033
Betadine Surgi-Prep - The Purdue Frederick Co., Norwalk, CT 06850-3590
Haldol tabs - PAR Pharmaceuticals, Inc., Spring Valley, NY 10977
Jungle Ball - Boomer Ball, Grayslake, IL 60030
Nolvasan solution - Ft. Dodge Laboratories, Inc., Ft. Dodge, IA 50501

