

## Controlling zebra hoof overgrowth through enclosure modification.

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If hoofed animals are provided with a fixed, textured substrate and motivated to ambulate over this surface, their hooves will require minimal or no trimming. Establishing inexpensive, artificial surfaces for hoof self-maintenance on opposite sides of the enclosure will motivate the animals to ambulate across the enclosure. Baiting these locations with salt blocks or feed will encourage this behavior. More activity will also increase visitor enjoyment while promoting the optimum physical health of the animal.

Current AZA requirements state that barn floors should be constructed of impermeable surfaces, such as brushed concrete, or other hard substrate in order to provide hoof wear. If not, periodic hoof trimming may be necessary (2005). These requirements do not provide guidelines regarding the substrate for outdoor enclosures. In many facilities, captive zebras are commonly kept on grass and/or dirt surfaces, which are aesthetically pleasing, but do not provide a sufficiently roughened surface for hoof maintenance. Therefore, regular hoof trimming may be necessary.

Hoof trimming of captive exotic animals is a dangerous and labor-intensive procedure for the animals, as well as zoo personnel. Annual or bi-annual use of anesthetics for hoof trimming, administered via blow dart or dart gun, is potentially avoidable through enclosure design or modification. It is well known that anesthesia is risky, particularly for exotic animals where reactions to sedation may be unpredictable. Excitement of flighty or aggressive animals adds to anesthesia risk and makes it difficult to monitor them during induction and emergence, the periods when complications usually occur (Bush 26-27). Common complications of anesthetic agents include bradycardia, muscle rigidity, muscle tremors, respiratory depression and hypotension. In an excited animal, a large drop in blood pressure can be fatal (Tribe and Spielman 1996). The danger is not solely immediate, as fatal anesthetic complications in zebras have been noted several days post-procedure. Over a fourteen-year period at the San Diego Zoo, 29% of zebras necropsied died from either anesthetic shock or capture myopathy (Griner 490-492). The risks of anesthesia are also not limited to the animal. Human injury can occur from “animal attacks, capture equipment or exposure to potent drugs” (McGill 2003). With this in mind, when anesthetizing any animal, particularly a wild one, a contingency plan for euthanasia should always be taken into account (McGill 2003). If one were to look at this issue purely from a risk management standpoint, anything that could be done to limit the exposure of the animal and the keeper to anesthesia should be evaluated and considered.

In the wild, plains zebras (*equus burchelli*) can walk approximately 40 km per day, which provides natural wear to their hooves. In captivity, however, animals are limited by the size of their enclosure and must rely on substrate for hoof maintenance. Exacerbating the problem, the diet provided in zoos is typically of a much higher quality than wild forage, which can lead to overweight animals and has been surmised to contribute to hoof overgrowth (Yates and Plowman 2004).

At the Three Ring Ranch, a small sanctuary in Kailua-Kona, Hawaii, three resident plains zebra are housed in a 1350 m<sup>2</sup> enclosure. The enclosure substrate, like most of Hawaii, contains several large outcroppings of textured lava. During the creation of the enclosures, it was decided



**Oreo, a senior mare, whose hooves have never been trimmed.**

to leave these higher outcrops so that the animals would have elevated lookout points as enrichment. As a side benefit, we discovered that by walking on the rough lava outcroppings, all of the zebra self-maintained their hooves.

The facility layout is made up of two bedroom areas and a larger pasture space. Within the bedroom area for the two younger zebras is a large lava ridge that the mares walk around and over, often standing on it to sunbathe (see photo below). After the zebras exit the bedroom enclosures, they walk or trot over another flat lava shelf to get to the outer pasture. The entire pasture has green areas divided by small hills and ridges, which provide additional natural hoof maintenance.

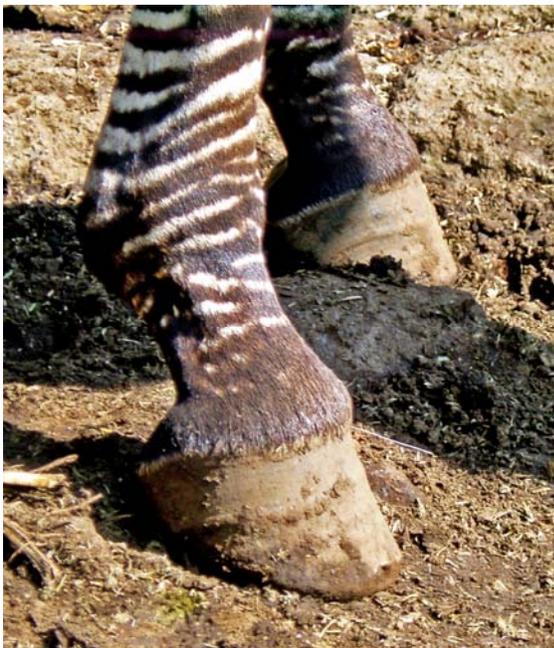


**Favorite lookout ridge for sun basking. Zoë is dozing in this photo**

rotating on a pole). An elaborate scratching post can be created by reinforced concrete sculpted to mimic a termite nest. A cement model of a termite nest (Hediger) has been in daily use in the Zurich Zoo since 1955 due to the zebras' enthusiasm in using it for grooming (Russell 2002). This false termite mound could also be used as a trace mineral block dispensing station to further encourage the animals' regular visits to the platform.

The addition of concrete to an enclosure contradicts many zookeepers' idea of a natural environment. Yet, the benefit to the animals' health should outweigh the aesthetic element. Also, the use of educational materials outside of the enclosure would be helpful in educating the public about the important service these surfaces provide. By placing these hoof maintenance stations on either side of the enclosure, the animals will be encouraged to ambulate more, increasing activity level and visitor enjoyment while also decreasing the risk of obesity.

For years, modern zoos have worked to provide a natural environment for their animals, avoiding the use of concrete; instead using natural substrate and planted areas. However, those surfaces do not provide adequate abrasion for the zebra hoof. An alternative solution to manual hoof trimming under anesthesia, based on the experiences here at the Three Ring Ranch, is to create low cost, low maintenance hoof filing platforms. These raised platforms could be constructed of rock or dyed, roughened concrete, upon which various objects could be placed to encourage the zebras to frequent them. These platforms can be as simple or as elaborate as the individual facility chooses. They can be made to resemble natural habitats or left as an inexpensive, functional pad. Objects placed on them might include salt/mineral blocks, water, scratching posts, feed, or hanging browse dispensers (such as a hay net



**Tootsie on lava. There is a small amount of dirt over the stone. This form could easily be imitated with dyed concrete. Spaces for hooves encourage stepping up and over the ridge.**

It is our conclusion that while zebras in captivity may have overgrown hooves which require the need for trimming under anesthesia, a few low cost and minimally intrusive additions to an exhibit, mimicking the natural lava outcrop, would minimize or remove entirely the need for human intervention. While we initially left the lava outcrops for aesthetic and enrichment purposes, we accidentally discovered their contribution to the animals' overall health and wellbeing. Our theory is that if these same adaptations were made to the enclosures of other exotic, hoofed species, they would have similarly positive results.

Table 1.

Name	Age	Birthplace	Medical Conditions	Diet (per day)
Oreo	22	Kenya	arthritis in right stifle and hip, 9 pregnancies (one stillborn)	COB <sup>1</sup> (0.54 kg), horse complete <sup>2</sup> (0.72 kg), oat/grass cubes (1.54 kg), pasture grazing or timothy grass hay, vitamin/mineral supplement, trace mineral block, equine senior <sup>3</sup> (0.23 kg, given Q.O.D)
Zoë	8	Molokai, HI	amelanosis	COB (0.68 kg), horse complete (1.0 kg), oat/alfalfa cubes (1.82 kg), pasture grazing or timothy grass hay, vitamin/mineral supplement, trace mineral block
Tootsie	7	on-site Kona, HI	none	COB (0.68 kg), horse complete (1.0 kg), oat/alfalfa cubes (1.82 kg), pasture grazing or timothy grass hay, vitamin/mineral supplement, trace mineral block

\*The only routine medical care these zebra receive is oral wormer and annual West Nile vaccine via blow dart.

<sup>1</sup> Purina Mills Grainland Brand Natural Feed Grains, corn/oats/barley/molasses mix.

<sup>2</sup> Hawaiian Grain Complete Horse Feed Pellet.

<sup>3</sup> Purina Mills Equine Senior.



**Zoë standing on one of the lava platforms, Tootsie in the background. Both just finishing browse enrichment.**

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