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RESULTS OF AN EEP SURVEY

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Abstract
Problems of the locomotory system (like overgrown hooves, laminitis or joint problems) have been reported from the EEP giraffe population. To evaluate relevant husbandry practices and frequency of the problem, a survey was done covering EEP institutions (response to the questionnaire from 70 institutions representing 74 individually managed groups). 40 of the 74 groups reported that cases of problems of the locomotory system had occurred in their animals. Animals older than 8 years seemed to have a higher probability to develop such problems. Giraffe were generally kept on concrete (69%) or asphalt (16%) floors. Being known as demanding animals to feed, giraffe were offered considerable amounts of non-forage feeds. An influence on the occurrence of laminitis is therefore possible. Based on studies on dairy cattle, indoor sections with softer floor surfaces should be considered as a viable option for facilities where problems have occurred repeatedly.

Key words: giraffe, Giraffa camelopardalis, floor surface, overgrowth, laminitis, feeding

Introduction
Despite the broad distribution of giraffes over numerous European facilities, they are still regarded as demanding animals in captivity. Repeatedly occurring problems in captive giraffe are related to either their locomotory system like overgrown hooves and joint problems (Kovacs et al. 1975) or to nutrition (e.g. Junge and Bradley 1993, Clauss et al. 2002, Hummel et al. 2003). In cattle husbandry, problems of the locomotory system like overgrown hooves, laminitis or joint problems are regularly mentioned to occur in large animals confronted with the husbandry practice and floors of agricultural settings. They are regarded as multifactorially influenced (Cook et al. 2004), e.g. by nutrition, parturition and obviously floor characteristics like hardness, abrasiveness or humidity. They generally develop when animals are not on pasture, but in their stables (Maton 1987).
To get an overview of the situation in European zoos, an inventory of the “state of the art” of several relevant aspects of giraffe husbandry in the EEP was initiated.
Materials and methods
The survey was conducted using a questionnaire designed by TL and WZ. Opportunity was taken of a parallel interest on this subject in equids, okapis and giraffes, so the questionnaire was sent to all facilities keeping these taxa (results see Equid TAG (2004) and Leus and Beer (2004)). Structured in 3 sections, it covered the areas housing (e.g. floor characteristics), nutrition (diets offered to the animals) and health problems (occurrence of hoof problems, laminitis or joint problems in the respective giraffe herd). It was sent to ~100 giraffe keeping institutions throughout the EEP, and returned to EEP officials by the beginning of 2004. A very satisfactory proportion of 70 facilities responded, representing 74 separately managed giraffe groups; this impressively high return rate may be taken as an indicator of the high significance zoos granted to the subject of the questionnaire. To exclude an overrepresentation of extreme outliers in the data, they were averaged by median (not by mean); accordingly, quartils (1st quartile/3rd quartile) are given to quantify data variance.

Results and Discussion
Housing of EEP giraffes
The average giraffe group size of this survey was 4 (3/5) animals. The size of the indoor enclosures was 30 (20/50) m² per animal (total indoor area was not evaluated). On average, giraffes stayed inside for 14 (13/15.3) h/day in summer and 20 (17-21) h/day in winter, so indoor hours were about 50% higher during winter. Due to the considerable time animals spend in their indoor enclosures, the floor surface and husbandry in this area is of particular concern. 69% of giraffe groups were kept on concrete floors, 16% on asphalt (plus 3% using a combination of the former two flooring types) and 5% reported tiles as surface (others mentioned by single institutions were asphalt pebbles, crushed limes and abrasive paint). Concerning the two main surface types used, asphalt was found to be a more secure ground for cattle (Herrmann 1997). The giraffes in this study seem to be generally provided with hard indoor floors; a recent study on cattle gives comprehensive evidence for the negative influence of slatted floors with hard surfaces on ungulate feet (Benz 2002) due to the induction of claw lesions by mechanical overload. Hard surfaces are even described to trigger hoof growth (Pougin and Schlichting 1983), and may lead to a lot of standing due to overload; a lack in locomotion activity obviously contributes to hoof overgrowth via a resulting lack of abrasion.

As bedding material for giraffes, 53% groups had straw, 19% straw plus wood chips, 11% wood chips, 7% sand plus straw, 5% straw plus shavings, 3% hemp/flax (wet!) (single groups had shavings and straw plus rubber mats). Air humidity in stables was characterised as “average” for 54%, as “moist” for 3% and as “dry” for 43% groups. The average temperature in giraffe stables during winter was 17 (15/18) °C. 49% of giraffe groups had a separate smaller pre-enclosure or hardstand in addition to a larger paddock. Average size of outside enclosures (including the hardstands) was 2600 (1500/10000) m². 45% of groups had sand pits as lying areas available. Such areas have been proven to be important lying areas during the day in cattle, providing overloaded feet with some relief and being used by animals as preferred rumination places during summer (Benz 2002). For 47% of giraffe groups, the outdoor enclosure was characterised as “well drained”, for 41% as “very soft after rain, boggy” and for 12% as having “surface water after rain”. Since wet hoof horn is considered to be worn down more easily in cattle (Camara and Grevert 1971), a reasonable degree of humidity can be beneficial for hoof horn integrity.

Nutrition
During summer, 81% of giraffe groups were fed lucerne hay, a high proportion of 84% received some browse, and 53% received fresh grass. Most facilities used a combination of different forages, lucerne hay+browse (31%), lucerne hay+browse+grass+grass hay (18%) and lucerne hay+browse+grass hay (15%) being the most common. Two facilities fed their animals the combination grass+grass hay. In winter, 53% continued browse feeding (twigs); the forage rations with the highest incidence were lucerne hay alone (27%) and
lucerne+browse (26%). Four giraffe groups got grass hay as only forage source during winter.

On average, a giraffe was offered an amount of non-forage feeds equivalent to 4.5 (3.2/5.8) kg DM/day (DM=dry matter). Assuming an average intake of 9 kg DM/(day*animal) and complete intake of non-forage feeds, this corresponds to 51 (38/66)% of the diet on a DM basis. During summer (winter values are comparable), animals were offered 3.4 (1.7/6.1) kg of fresh fruits and vegetables per day corresponding to a percentage of 4.7 (2.3/8.5)% of a 9 kg DM intake. 9.3 (4.2/19.4)% of a 9 kg DM intake consisted of easy fermentable feeds like grains, bread and fruits and vegetables.

Occurrence of problems of the locomotory system

For about 18% of the ~350 animals represented by the study, problems in the locomotory system were reported. 54% of groups reported at least one case either of overgrown hooves (47% of facilities), laminitis (14%) or joint problems (35%) (or a combination) in their giraffe herd. Where sexes were mentioned, males and females contributed equally. Problems of the locomotory system occurred in 63% of the 19 G. c. reticulata groups and in 47% of the 19 G. c. rothschildi groups. 57% of the groups of west European giraffe groups were affected, while the rate in eastern zoos was 35%.

Joint problems (34 cases) were generally described for front legs (24 cases), with only 5 cases for a combination of front and hind legs and 5 cases of hind legs only. Of the latter 5, 3 were explicitly stated to be caused by inbreeding or trauma.

Figure 1 gives the distribution of the first occurrence of overgrown hooves over the age classes. For giraffes older than 8 years, a higher incidence was found. This underlines the experience of giraffe EEP officials that large, heavy animals like breeding males and females are at particular risk (Schleussner pers. comm.). Inside space was 26 (20/45) m² per animal where hoof overgrowth/laminitis had occurred, while in groups not affected this was 42 (25/58) m².

There was a trend for facilities with cases of laminitis to have a higher proportion of easy digestible feeds (bread, pure grains, fruits and vegetables) in the diet (Without laminitis: 8.9 (4.6/16.8)%; with laminitis: 17.4 (9.8/27.1)%). Of the survey data, 3 cases were specified explicitly as carbohydrate laminitis. Concerning the potential connection of the occurrence of overgrowth/laminitis to dietary parameters (Clauss and Kiefer 2003), no other difference between affected and nonaffected facilities could be detected. The fact that hoof problems in ruminants are rarely reported in grazing species, but with some regularity in specialised browsers like moose, okapi and giraffe, which tend to have a low forage intake in captivity (Clauss et al. 2003) may be taken as indirect evidence for an influence of diet on hoof health of zoo herbivores. The considerably high amounts of non-forage feeds offered to giraffe fit into this picture. Possible connections between high non-forage intakes and hoof problems can be via laminitis (Nocek 1997) or impaired microbial biotin production (Fiedler and Maierl 2004).

In cattle, the time around calving is considered to be of particular concern, but only one zoo gave a comment pointing to a connection of laminitis and parturition.

Based on the examination of comprehensive wild and captive material, Von Houwald (2001) gives recommendations concerning husbandry practises beneficial for Indian Rhino feet. Although giraffe feet are not regarded to need the same degree of softness, humidity and low abrasiveness as those of Indian rhino, a shift in husbandry practice in the direction of areas with soft floors (avoiding overload and encouraging locomotion), and a dietary scheme avoiding pronounced peaks in rumen fermentation is likely to be beneficial for giraffe feet, too. For facilities with repeated problems in their giraffe herds, a shift from an exclusively hard floor (like concrete) to a more variable floor system including abrasive and therefore typically hard, but also extensive soft floor sections may be an option. Obviously such a change should best include close monitoring and documentation.
References


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![Distribution of first occurrence of hoof overgrowth or laminitis in giraffe over age classes](juehummel@aol.com)