Nutrition and feeding of African ungulates during quarantine at Dvur Kralove Zoo

ALEXANDRA FUNDOVA

Head, Nutrition Department, Zoological Garden, 544 01 Dvur Kralove, Czechoslovakia

Ungulates brought to the Dvur Kralove Zoo after capture in Africa are put into quarantine for about three months. Immediately upon capture they are given feed similar to that which they will get later on in the zoo: African cattle pellets, bran, maize, high quality pressed lucerne and twigs (4). A quantity of this food accompanies the animals to the zoo, so that for a short period they continue with their African diet. In the course of their three months' quarantine this is eventually completely replaced by locally available components.

The accompanying tables indicate final rations at the end of the quarantine period. During quarantine itself the food constituents vary widely according to the animal's ability to adapt itself to the local diet and according to its general state of health. These rations are supplied in winter, in summer hay being replaced by mixtures of lucerne and corn, and frozen twigs by fresh ones. While the animals are quarantined we provide only winter rations, even though the quarantine period usually takes place in summer. This is mainly because fresh fodder brings the danger of flatulence, and also because the animals adjust more easily to hay than to green mixtures. Some smaller and more delicate species have to be taught to eat zoo food, especially pellets, by initially substituting dried apples, dried beet pulp, acacia husks imported direct from Africa etc. Larger species usually accept their new diet willingly from the very beginning.

We try to maintain the health of animals in quarantine at the same level as it was on arrival, and gradually to improve it, even at the risk of making them overweight. Only after they are accustomed to the local diet, and at the end of the quarantine period do we slowly reduce the quantity of grain fodder. Grain fodder also partially replaces twigs, which are supplied in greater quantities in the quarantine period. Later on, twigs are given only as a supplement to hay and green feed.

Current research has shown that ruminants may be divided into several groups according to their food requirements (3):

1. Species feeding on rough common grass, eating the upper parts which contain more grass leaves. This group includes hartebeest Alcelaphus, Hunter's antelope Damaliscus hunteri, blesbok D. phillipsi and bontebok D. dorcas dorcas.
2. Species requiring fresh grass and fresh water. These include waterbuck Kobus ellipsiprymnus and K. megaceros, White-bearded gnu Connochaetes taurinus albojubatus and Cape buffalo Syncerus caffer.
3. Species, such as Oryx, which feed on dry grass, including the stalks.

Animals belonging to these three groups consume about 95% grass and only about 5% of other herbs, including shrubs and leaves.

Species requiring a juicy and concentrated diet constitute another broad grouping:

1. Reticulated giraffe Giraffa camelopardalis reticulata, Lesser and Greater kudu Tragelaphus imberbis and T. strepsiceros, which are all kept in large herds in the zoo, feed on the leaves of trees and shrubs.
2. To this group belong animals preferring various sorts of grass, but occasionally accepting the leaves of trees and shrubs. The composition of
| Weight of animal (kg) | HARTEBEEST | CAPE BUFFALO | GIRAFFE | GREATER KUDU | LESSER KUDU | GEMSBOK | ELAND | BOAN | ANTELOPE | SPRINGBOK |
|-----------------------|-------------|--------------|---------|---------------|-------------|---------|-------|------|-----------|------------|
| Pellets               | 0.4         | 1            | 2       | 1.5           | 0.5         | 1       | 1.5   | 1.5  | 0.4       | 60         |
| Crushed oats          | -           | 0.8          | 1.3     | 0.7           | 0.4         | 0.5     | 0.5   | 0.5  | -         |            |
| Oat flakes            | 0.2         | -            | -       | 0.5           | -           | -       | -     | -    | 0.3       |            |
| Maize                 | 0.4         | -            | 0.7     | -             | 0.3         | 0.5     | 0.5   | 0.5  | -         |            |
| Dried apples          | 0.2         | -            | 1       | 0.5           | 0.2         | -       | 0.5   | 0.5  | -         |            |
| Dried sugarbeet pulp  | 0.05        | 0.3          | -       | 0.2           | 0.1         | 0.3     | -     | 0.2  | 0.05      |            |
| Carrots               | 0.3         | 1.5          | 4       | 1             | 0.3         | 1       | 1.5   | 0.3  | -         |            |
| Pelleted alfalfa meal | 0.05        | 0.2          | 0.3     | 0.1           | 0.05        | 0.15    | 0.2   | 0.2  | 0.05      |            |
| Hay                   | 1.2         | 7            | 6       | 3             | 1.5         | 3       | 6     | 3.5  | 1.5       | 2.75       |
| Straw                 | 0.8         | -            | -       | -             | -           | 1       | -     | -    | -         |            |
| Frozen poplar         | 0.05        | -            | 1.5     | 0.5           | 0.3         | -       | 0.5   | 0.1  | 0.05      |            |
| **TOTAL (kg)**        | **3.35**    | **10.8**     | **16.8**| **7.5**       | **7.45**    | **7.65**| **10.7**| **8.5**| **2.75**  |            |

Table 1. Daily ration for ungulates at the end of their period of quarantine at Dvur Kralove Zoo. All quantities are in kg. Vitamin and mineral supplements and salt are also supplied daily.

| Weight of animal (kg) | HARTEBEEST | CAPE BUFFALO | GIRAFFE | GREATER KUDU | LESSER KUDU | GEMSBOK | ELAND | BOAN | ANTELOPE | SPRINGBOK |
|-----------------------|-------------|--------------|---------|---------------|-------------|---------|-------|------|-----------|------------|
| Dry matter (kg)       | 3.63        | 8.18         | 11.51   | 5.75          | 2.78        | 5.89    | 7.77  | 6.27 | 2.14      |            |
| Crude protein (kg)    | 0.24        | 0.80         | 1.3     | 0.79          | 0.31        | 0.69    | 0.87  | 0.7  | 0.23      |            |
| Crude protein as % of dry matter | 9.1 | 9.8 | 11.3 | 13.8 | 21.07 | 11.6 | 8.1 | 8.2 | 8.5 |
| Ca (g)                | 7           | 10           | 32      | 21            | 11          | 16      | 27    | 21   | 7         |            |
| P (g)                 | 4.65        | 9.8          | 18.4    | 13.2          | 4.9         | 9.2     | 14.4  | 13.8 | 4.65      |            |
| i.u. Vitamin A        | 55,000      | 104,000      | 130,000 | 48,000        | 22,500      | 46,800  | 100,000 | 80,000 | 22,500    |            |

Table 2. Composition of nutrients in the daily ration.
their stomach contents shows about 55% grasses and 45% herbs and leaves. Roan *Hippotragus niger* and Sable *H. niger* antelope and springbok *Antidorcas marsupialis* are included in this group.

3. Species, such as cland *Taurotragus oryx*, preferring herbs and the leaves of trees.

Knowledge of food composition from the analysis of stomach contents of captured animals has helped us greatly in preparing their diet during the acclimatisation period and while they adapt to local food.

**RATIONS AND FEEDING TECHNIQUES**

Table I shows rations as provided for ungulates on transfer from quarantine to their permanent living quarters. The most difficult to acclimatise and adapt to a new diet are hartebeest and springbok which have only light protein requirements. We gradually wean them from lucerne to hay. They are content with rough, mountain hay, but it must be well dried without trace of fungi or moulds to which they react adversely. They are very fond of oat straw and, most of all, of a mixture of husks and corn, but this must be fully ripe and the mixture pressed into bales. In summer, also, they prefer very ripe mixtures. If the components are not sufficiently ripe, we have to add hay and straw in the ratio of 2:1. Generally speaking, these species are very difficult to adapt to the local hay, husks and corn fodder. The Hunter's antelope in particular, at first refused totally to accept the local feed until we attached small bundles of fodder vertically to their feeding troughs.

The grain accepted most willingly was crushed oats. Later on oat flakes proved to be better for them – indeed, some authors believe that crushed oats are unsuitable for smaller animals, which digest them with difficulty or not at all. There also exists the danger of injury to the mucous membranes of the mouth, or of inflammation caused by oat chaff.

The species most adaptable to a captive diet proved to be the Cape buffalo, which eats any sort of hay, even of poorer quality, and green fodder. Like all our zoo animals they become accustomed to pellets only slowly, but accepted carrots in any quantity. White-bearded gnu, waterbuck and similar species also adapt easily to our diet.

Oryx, like hartebeest, at first preferred straw, even of poorer quality, to hay and got used to hay only after it had been mixed equally with straw. In summer they also prefer riper mixtures with a larger proportion of cereals than husks. They accepted grain and carrots readily from the very beginning, so that it was not necessary to introduce them to dried apples.

Giraffe and Greater kudu also fed well from the start. During quarantine we try to give them as many twigs and leaves as possible, although later on twigs serve merely to supplement the hay and green feed. In summer they get whole leafy branches – from which they will strip even the bark – while in winter we give them dried or frozen twigs taken from the tree tops. They prefer sweet hay with a high proportion of dried leafy plants and mixtures with a high husk content. Lesser kudu, on the other hand, are relatively difficult to adapt. They prefer lucerne to hay, at first accepting very little grain fodder and no carrots at all. Even after three months they did not accept all the food they should have.

Roan antelope, too, were reluctant to adapt to hay and green fodder, even when mixed with straw, and this situation improved only gradually. Grain, however, was accepted readily from the very beginning. Eland, despite their natural preference for leaves and twigs, adjusted to hay and green feed without trouble. All these animals are given vitamin and mineral supplements in gradually increasing quantities from the start of quarantine.

**CONCLUSIONS**

Whereas for grazing species crude protein intake represents about 8-10% of dry matter, it is higher for animals which feed mainly on leaves – about 11-14%. In the latter case, to raise the protein level of their diet at the beginning of quarantine, we added low fat dried milk powder to the animals' grain fodder. At London Zoo, for example, young deer are given 13-16% crude protein, and adults 11-12%. Bilby (2) and Abrams (1) suggest 20% for young animals and 10% for adults.

The level of beta-carotene as a food component varies, mainly because hay and carrots, if stored for too long, even under ideal conditions, lose almost all their beta-carotene content. It is therefore necessary to supplement vitamin A by up to
50% with various vitamin supplements; we ourselves have achieved good results with Farmaferr and VAD-T and VD-P₄. Calcium and phosphorus are supplied both in food mixtures and in vitamin supplements. The quantities indicated in Table 2 proved sufficient for all animals.

At the end of the quarantine period, animals were on the whole very healthy, food intake being quite sufficient both in quantity and quality. It is most important, however, to observe absolute hygiene in the preparation of all food, as the animals, as yet unused to a zoo diet, are very sensitive to the smallest impurity. Acclimatised specimens are no longer so delicate. Feeding techniques also play an important role. Very often subterfuges have to be employed to make the animals accept the unaccustomed food.

PRODUCTS MENTIONED IN THE TEXT

Farmaferr: manufactured by VUB-PVZ Kourim, okres Kolin, Czechoslovakia.

VD-P₄: manufactured by Bioveta, Slovenska Lupca, okres Banska Bystrica, Czechoslovakia.

VAD-T: manufactured by Bioveta, Slovenska Lupca, okres Banska Bystrica, Czechoslovakia.

Vitasa: manufactured by Bioveta, Ivanovice na Hane, Czechoslovakia.

REFERENCES

1. Abrams, J. T. (1968): Fundamental approach to the nutrition of the captive wild herbivore. Symp. zool. Soc. Lond. No. 21: 41-62.

2. Bilby, L. W. (1968): A pilot scheme to investigate the diets of some of the mammals at the London Zoo. II. Ungulates. Symp. zool. Soc. Lond. No. 21: 77-87.

3. Hofmann, R. R. & Stewart, D. R. M. (1972): Grazer or browser: a classification based on the stomach-structure and feeding habits of East African ruminants. Mammalia 36.

4. Wagner, J. A. (1973): Capture and transport of African animals. Int. Zoo Yb. 14: 69-73.

Manuscript received 2 April 1973