



## Optimizing diets in Zodiac Zoos

Zodiac Zoos is the umbrella organisation for four zoos in the Netherlands: Dierenpark Wissel in Epe, Zoo Parc Overloon in Overloon, Aqua Zoo Friesland in Leeuwarden, Zoo Labyrinth Boekelo in Boekelo. This year Zoo Labyrinth Boekelo became part of Zodiac Zoos. A special feature of Zodiac Zoos is the animal collection with many unusual species, such as agile mangabeys, binturongs, white-cheeked gibbons, tamar wallabies, red-handed tamarins, spiny-tailed iguanas, etc.

As a rather young and fast growing organisation, Zodiac Zoos want to increase the quality within the organisation. Nutrition is one of the aspects that has to be professionalize within the Department of Zoology. In the past nutrition was part of the work of the curator. Because of our growing organisation we have chosen for an assistant who works full time on nutrition at the Department of Zoology. Since January 2005 we have an assistant under employment, which is familiar with all the known facets of nutrition. The following tasks are performed by this assistant:

### *Analysing diets*

All diets fed to the animals have been documented into the computer programme Zootrition. The nutritional content of specific food items were compared and the overall nutritional composition of diets were calculated.

### *Optimize the diets of species in the zoos*

Some diets were not complete or different ingredients were fed to animals. To optimize the diets, another important aspect, is getting the amount correct. There should not be much food left after feeding the animals. This saves food, preparation time, cleaning time, and thus money. Also important: less vermin. When a lot of food keeps laying on the ground, mice, rats and insects are attracted to the food. After research some diets contained too much of one or two nutrients. For instance, the diet of the Hartmann's mountain zebra's (*Equus zebra hartmannae*) was not optimal. We analysed the diet in Zootrition and consulted an veterinarian. It was found that the diet had a shortage of vitamin E. The former supplement, with many different minerals and vitamins, was partially replaced by a new supplement which had a higher content of vitamin E.



When ingredients are no longer available at the market a new one should be found and the diet should be optimized again. This happened with the supplements for our fish-eating animals (for example Humboldt penguins (*Spheniscus humboldti*), jackass penguins (*S. demersus*) and South American fur seals (*Arctocephalus australis*). The tablet we had, was not available anymore and we were forced to look for replacement. The one we found was manufactured by a Dutch producer of animal feed, Twilmij. A disadvantage of this tablet was the high concentrate of vitamins. The assistant contacted the producer and together they found a solution which resulted into a new product called Akwavit Minitab. This tablet is a factor 10 smaller in concentration of vitamins than the normal tablet. The Dutch producer is also manufacturing a tablet which will not smell bad, because the South American fur seals dislike the tablet they get now.

#### *Changes in existing diets*

There are several aspects through which a diet can change:

- \* Diets are always adjusted to the number of animals in a group.
- \* Sick animals get an adjusted diet which can help to restore their health sooner.
- \* Animals from another zoo which are in quarantine, will get the same food for a couple of days until they are fully used to the food which we are feeding to the animals.
- \* Some animals get different diets through the year. It happens that diets are adjusted to the season because of the needs of the animal or the season related ingredients of a diet.
- \* A lot of nutrition research is done by researchers and zoos all over the world. We will get our proceeding insights from advisors, colleges from other zoos and zoo associations, veterinarians, the European Zoo Nutrition Centre, universities, internet and own experiences.

#### *Changes from an old diet into a new diet*

In autumn 2005, we started with a different diet for the Callitrichidae. The old diet contained besides vegetables and fruit also an inhouse mix of banana, yogurt, casein, echinaforce, vitamins A and D, seaweed, cereals etc. The animals were healthy on this diet but the diet was very labour intensive to prepare by the zoo keepers. The preparation of the diet took much time and many ingredient had to be ordered separately. Another problem of the inhouse mix were the nutrients. Not every inhouse mix does contain exactly the same content. The shelf life is very short, therefore the mix has to be prepared every day. Because of these aspects we decided to change the inhouse mix into New World Primate pellets. First we compared the nutrients of the inhouse mix with the nutrients of the pellets. After completing and optimizing the new diet with vegetables and fruit, we first tried the diet on the black-eared marmosets (*Callithrix penicillata*). They got a habituation period for one and a half week. In this period the ingredients of the old diet were slowly replace by ingredients of the new diet. After one and a half week the animals were completely shifted from the old to the new diet. The new diet contains less fruit and vegetables unlike with the old diet because of the better balance.



It took a while after the black-eared marmosets got used to the New World Primate pellets. In the beginning they did not ate the pellets very well, but after a while they got used to it. Still the animals prefer the inhouse mix, which they only get when they are on medication. After each meal they still leave some pellets over. The animals are in good condition in spite of the left over after each meal. We think that the pellets have a higher nutritional value. Thereby the pellets are not as sweet as the inhouse mix. The marmosets still like the fresh fruit and vegetables very much but this can be explained by the amount of water and sugar in it.

#### *Newly arrived animals*

When new animals arrive at one of the zoos of Zodiac Zoos, a diet list is requested from the delivering zoo. If the diet differs from the diet which we feed than the old diet would be fed only for a period of time. In this period the animals will slowly get used to the diet. Every day the ingredients from the animals' old diet are mixed with the ingredients of its new diet until the diet only contains the new ingredients.

#### *Daily reports of the Department of Animal Care*

All important experiences of the zoo keepers during their work is written down in daily reports. In these reports a zoo keeper writes down his experience with an animal and its diet. The assistant analyses the changes in diets and communicates the changes with the curator and zoo keeper.

In ten months time a lot of work has been done by this assistant of nutrition. After a year Zodiac Zoos will evaluate the nutrition work done and the progress. The future plan is getting all our diets into Zootrition and calculating the optimal diets of our animals. We also want to complete the feeding guidelines for the pygmy hippopotamus (*Hexaprotodon liberiensis*). This year we had several students which worked on nutrition research in cooperation with a University and the European Zoo Nutrition Centre. We will publish some of these projects in the future. In a short period we will also complete our nutrition manual.



***Drs. ing. Esmeralda Dols, Zodiac Zoos, The Netherlands***