ZOO ANIMAL FEEDING EVALUATIONS, REASONS TO COMBINE FORCES

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Malnutrition and a lack of natural feeding stimulants are common in captive zoo animals and can lead to abnormalities such as stereotypic behaviour, diarrhoea, anaemia, osteoporosis, obesity, abnormal coat colour, eye-discharge, stunted growth, poor reproduction and a reduced resistance to infectious disease. Captivity commonly reduces an animal's natural wellbeing. The nutrient and feeding (enrichment) requirements of zoo animals are poorly understood, they vary considerably between animals of different species and comparative feeding research in wild and captive zoo animals is inherently difficult. It is necessary to adopt a practical and investigative approach towards establishing appropriate zoo animal nutrition. It is a process, which, for a successful completion, needs observation, administration, measurements, an exchange of experience, multi-disciplinary expertise, continuing attention and a bit of good luck.

The keepers of zoo animals should be aware of the problems in feeding their charges and should discuss and compare their experiences with those keeping similar animals. Animal feed record keeping is essential and should include the feeds and amounts offered, feed left over, feed analysis, feeding intensity, time spent feeding, behavioural observations, feeding-enrichment practices, bodyweights, body condition. With this information useful comparisons can be made with;

1. Husbandry manuals etc. prepared by the nutrient advisory groups of Zoo Organizations (see: www.nagonline.net www.eznq.org and www.caza-narg.org).
2. Authenticated research on wild and captive animal biology.
3. Experiences of colleagues (i.e. keepers, veterinarians etc.).

A diet and feeding evaluation is best done by a zoo animal nutritionist, who can assess recorded feed intakes, analyze animal data, sample feeds for chemical analysis, check the quality of the feeds and assess the effectiveness of feeding enrichment practices. The use of computer programs (e.g. ZOOTRITION™) can be of great help, however, like any other computer program, the quality of the output is very much dependent on the quality of the input. For example, the biochemical composition of feed materials can vary considerably and it is recommended to use the mean values of several results from relevant and authenticated feed analysis. Availability of good nutritional values, (e.g. % calcium, IU Vitamin A, etc) allows nutrient comparison of diets with different feed materials, identification of nutrient origins (i.e. which feed material contributes which, and how much nutrient) and accounting of daily nutrient intake which can be used to estimate how closely nutrient requirements are met.

Biochemical analysis of blood, hair or animal tissues and their comparison to "normals" can be important data for evaluation by a nutritionist and post mortem and histopathological examination results of tissues may also be useful to identify nutritional imbalances. However, advice on the latter should always be sought from an experienced comparative pathologist. One should generally be very skeptical of any chemical or biochemical analysis and only authoritatively use those results derived from proven authentic and repeatable analysis whether in feed, water, the animal or in its excreta. Records of general and feeding related behaviours can be very important. Authentically quantifying and comparing behaviours and concluding advice from these requires an experienced zoo animal behaviour expert.

The nutritionist will weigh up the amounts, ratios and qualities of the nutrients in the diet and relate this to information from a pathologist, a behaviouralist and animal records. The nutritionist adds or subtracts nutrients, feeds or practices, where considered necessary, leading to a reviewed nutritional design which may require different feeding materials, amounts, feeding times, intensities and enrichment practices. Once agreed upon, the new dietary plan is implemented and observations and measurements are kept to see if improvements have been made.

Evaluations of nutrient supply and feeding management can elucidate the aetiology of a suspected disorder.

For example:
• A diet without wheat gluten resulted in a major improvement in the wellbeing of tamarins (*Saquinus labiatus*) suspected (but not diagnosed!) with coeliac disease (gluten intolerance).
• A low blood or liver copper result does not automatically mean that copper in the diet needs to be increased. Sulphur, molybdenum, iron, zinc and tannins are among secondary and tertiary dietary factors which reduce copper availability and these could be changed to allow a more normal copper metabolism.
• Selenium deficiency is, without the availability of histological analyses, best diagnosed from both blood and dietary selenium analyses and allows for more precise dietary fortification.
• A simple change in feeding management significantly improved natural prey tracking behaviour, increased time spent in the feeding area and reduced rapid feeding rates in captive strawberry dart frogs (*Dendrobates pumilio*) when their feed (a dish with live pinhead black European crickets (*Grylliis bimaculatus*)) was covered with leafs, making the appearance of crickets unpredictable.
• A decrease in the feeding intensity (not amounts!) of overweight captive lions (*Panthera leo*), from daily meals with one fast day per week, to feeding three times per week (a gorge and fast regime) resulted in increased appetitive active behaviour, did not increase agonistic behaviour and resulted in similar body condition to their free roaming counterparts.

In captive animal management, decisions to change nutrients, feeds, feeding management or feed enrichment practices with the aim of improving the zoo animals' welfare, are best supported by combining data from nutrient, feeding and animal evaluations.

References for this text can be found on www.wmenews.com

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