FATTY ACID STATUS OF FREE-RANGING AND CAPTIVE WILDLIFE – A LITERATURE SURVEY

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Extended Abstract

In human nutrition, the discrepancy between the fatty acid (FA) status of people from "original" and "civilised" living conditions is interpreted as a major contributing factor to "civilisation-related" diseases. People from "civilised" living conditions are often characterised by a low status of polyunsaturated fatty acids (PUFA), particularly of n-3 PUFA, and a low unsaturation index (UI); the proportion of n-6 PUFA is usually increased, resulting in a decreased n-3/n-6 ratio. In human medicine, these changes are thought to be associated with increased susceptibility to cardiovascular diseases, reduced cognitive development of infants, reduced memory and visual capacities in senescence, certain cancers, unfavourable immunological reactions, male infertility, depression, aggression, and psychoses.

The major determinant of body FA composition is the FA composition of the ingested diet. From the very beginning of FA research in humans, a parallel finding in comparisons of FA status between free-ranging and captive wildlife has been noted,[2] and sporadically, similar observations were published for certain species. Should this be a common trend, then this could possibly be of relevance with respect to the health and welfare of captive wildlife.

There is a wealth of publications reporting the FA composition of living organisms, and therefore, we wanted to perform a literature survey to identify as many species as possible for which data on the FA composition of free-ranging and captive animals was available. Starting from results list of search engines listing > 2000 publications for "fatty acids", we identified approximately 450 publications that contained data on the FA composition for 288 different species of vertebrates. These publications were subsequently screened for data on free-ranging and captive individuals of the same species, of the same body tissues, and the same lipid classes. The latter matching was necessary because different researchers have analysed FA composition of different body tissues (e.g., muscle or adipose tissue) and of different lipid classes (e.g., phospholipids or triglycerides). As there are (systematic) differences in FA composition between different tissues and lipid classes, only results for identical substrates should be compared. The obtained results were evaluated separately for fish, reptiles, birds, and carnivorous/omnivorous and herbivorous mammals.

In spite of the large number of publications, the number of species for which information was available for both free-ranging and captive individuals was relatively small with 5 fish, 4 reptile, 7 bird, 7 mammalian omni- and carnivore, and 11 mammalian herbivore species. There were no consistent differences in FA status between free-ranging and captive fishes, reptiles or mammalian carnivores and omnivores. In contrast, captive birds and mammalian herbivores consistently had a lower PUFA and n-3 FA status, a lower UI and a lower n-3/n-6 ratio than their free-ranging conspecifics.

As FA composition of body tissues is determined by the diet, one should try to explain the observed differences by the diets used in captivity. Given literature data on the FA composition of different feeds, the pattern observed in birds and herbivorous mammals is most likely due to a widespread use of forages conserved by drying (low PUFA content) and of grain-based mixed feeds (low n-3, high n-6).[4]

Regardless of anecdotal suspicions of FA-related disease syndromes in captive animals, there are – with one exception of skin lesions in capuchin monkeys[3] - no systematic descriptions of PUFA or n-3 deficiencies in captive wildlife. However, in parallel to results from studies in humans or laboratory animals, long-term effects such as reduced immune status, reduced reproductive potential, reduced longevity or reduced cognitive development could be suspected, which could affect the success of breeding or reintroduction programs. In human medicine, the efficacy of PUFA supplementation is routinely assessed by placebo-controlled, double-blind, large-scale studies, which are not feasible in zoo animals. The question of whether a feeding regime of birds or herbivores should be changed to closer mimic the FA composition of the natural diet a species had adapted to, therefore, cannot be answered with the support of controlled studies or clinical evidence. The answer will rely mostly on the readiness to suspect similarities between wildlife and laboratory animals/humans, the conviction that diets in captivity should resemble natural diets in as many aspects as possible, and by the feasibility of the according, necessary measures.

An increasing use of fresh forage (e. g., cut grass, lucerne, or browse), silages instead of hays, and mixed/pelleted feeds that are based on forage meals (grass or lucerne meal), that are supplemented with linseed products and that do not contain significant amounts of grain products, would enhance a FA status closer to that of free-ranging animals (herbivores). With regard to fresh forage provision, such changes would help to alleviate a common problem in many herbivore collections, i.e. the acquisition of hays of acceptable quality. If hays are replaced by fresh forage during the vegetation period, and partly replaced by silages during periods where fresh material is not available, then problems related to hay quality and acceptance could be reduced. With regard to the formulation of mixed/pelleted feeds, a drastic reduction of the grain component should be possible, but traditional recipes would have to be abandoned, separating production lines for domestic livestock and zoo herbivores even further. The inclusion of linseed products in herbivore diets have been demonstrated to increase the n-3/n-6 ratio.[1,5]

References

(as the list of references would exceed the length of the text many times, only a few selected references are included in this abstract; for further information, please contact the corresponding author)

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