Lion food in Pilsen Zoo and BG

Lions and all other large felines are carnivores. It was presumed that the most suitable food for them is meat, which was served every day in the recommended dosage of 7.5 – 10 kg of beef muscle with bone per lion. However recent research suggests that this assumption is false. Lions living in the wild consume whole vertebrates, including their muscles, skin, fur/feathers, innards, and bones. They get their minerals, vitamins, and fatty acids from various sources like organs, fat, bones, and connective tissue, not just from meat. In the wild they have a balanced diet, as they consume animal protein, which is easier to digest, making them able to break down lesser amounts of glucose, and have a faster protein metabolism. Their food contains many premade amino acids, fatty acids, and vitamins. It is difficult to supplement their natural diet in zoos, however it is not impossible.

We were forced to ponder this problem after a tragic event. In 2019, our young lioness Damali fell sick with an illness called Stargazing, which sadly proved to be fatal. The cause of the illness lies in vitamin A deficiency, which is especially damaging for young and growing animals, as it causes a metabolic bone sickness. It is imperative for the healthy growth of the animals to have an abundance of vitamin D3, thiamine (B1) and copper, so supplying all of the necessary nutrients in their food became our highest priority.

One of the ways to supply all the necessary minerals and vitamins is giving them supplemented meat. While the dosage of supplements is very complicated, eating supplemented meat can also lead to an imbalance of the Ca:P ratio, which should be kept between 1:1 and 2:1. The dosage of the fat-soluble vitamins (A, E, D3) can be tricky, as they can become toxic in high doses.

Feeding lions and other large felines suddenly becomes alchemy. One easy solution remains though – feeding the felines with whole animals. After Damali died, we decided to thoroughly test this solution. The lions are given entire ungulates, which are no longer needed in the zoo either because of injury or overpopulation. The lions are therefore given the most natural and fresh prey possible. Aside from undulates, they are also given sheep, goats, rabbits, chicken, and beef. We of course abide by all the necessary veterinary rules and regulations.

Alchemy of feeding lions from a scientific perspective:

Feeding with whole animals and feeding with supplemented meats were both deemed insufficient on their own. It is therefore recommended to combine the two methods for achieving a more balanced diet.

Because:

• Meat-only diet is deficient in minerals and vitamins, which must be provided from supplementary sources.

• Fresh pray contains a lot of minerals and vitamins and doesn’t require supplementing.

• Whole pray feeding reduces the risk of gastritis and other gastrointestinal ailments.

• Feeding with a mix of whole pray and well supplemented meat reduces the risk of mineral imbalance resulting from pure supplemented meat diets.

• Feeding whole rabbits decreases the concentration of fecal markers for gastrointestinal inflammation and diarrhea compared to feeding with supplemented beef.

• The protein to fat ratio (6.6:1) in the muscle feed is significantly higher than in whole prey (3:1).

• The high protein to fat ratio in beef muscle feed is a contributing factor to chronic kidney diseases.

• Fat is important for many bodily functions, including vitamin absorption from the intestines. Therefore, it is recommended to avoid lean meat and let the meat retain the fat, resulting in a better protein to fat ratio.

• Vitamins A, E and D3 are fat-soluble and are stored primarily in organs and fat tissue. Fresh prey usually contains an abundance of these vitamins in its organs and fat tissue.

• Vitamin D can be procured from fat, liver, and blood of the prey (unlike with other mammals, being exposed to sunlight is insufficient for the bioconversion to the active form of vitamin D). This vitamin participates in the homeostasis of calcium and phosphorus.

• Low fertility and poor health condition are linked to a vitamin A and E imbalance. Felines lack the ability to convert the necessary quantities of beta-carotene to retinol. A retinol deficiency is linked to ataxia.

• An oft overlooked mineral is sodium (Na). It can be found in high concentration in the blood and organs rich in blood.

• Copper (Cu) is necessary for a variety of bodily functions, its deficiency causes ataxia, paralysis and paresis of limbs in juveniles. Poultry has low concentrations of copper, and attention must be paid to the chicken feed, so that it contains adequate quantities of copper.

• Dietary and circulating fatty acids are a valuable source of energy, provide the structural components of biological membranes, help in the creation of hormones, cell signaling, and function as modulators of gene transcription. Lions are obligate carnivores and therefore need certain fatty acids, like for example arachidonic acid in their diet, in order to ensure success on the hunt.

• Fats are composed of numerous fatty acids, with the most beneficial for the felines being saturated fatty acids. Ruminants have the highest amount of these fatty acids, so they should form the backbone of any healthy diet for lions.

• Saturated fatty acids are very unstable and are quick to spoil when stored. Prey is consumed fast in the wild, leaving little room for oxidation of the fatty acids. An increased intake of oxidized fatty acids can have its health risks. The symptoms of the lack of essential fatty acids are skin lesions, hair loss, dry skin, ulcers, problems with eyesight, sperm abnormalities and a lack of rutting in females.

• Taurine is an essential amino acid (inorganic compound formed by proteins, the body is unable to synthesize it). The lack of this amino acid can lead to retinal atrophy, hearth muscle diseases and lower reproductive success.

• Feeding with fresh prey additionally stimulates their natural behavior, increases oral health and mental well-being.

Obligate carnivores

They primarily process protein and fat as their source of energy, have a limited ability to process carbohydrates and cannot synthesize some essential substances from precursors contained in plant-based feed (e.g., vitamin A from beta carotene arachidonic acid from linoleic acid). They also have increased requirements for several essential amino acids (taurine, arginine) and require a high percentage of animal-based feed.