Links between ruminants' feeding behaviour and their welfare

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Ruminants select diets that are higher in nutrients and lower in secondary compounds than the average available in the environment. Individuals can better meet their needs for nutrients and regulate their intake of secondary compounds when offered a variety of foods than when constrained to a single food, even if the food is nutritionally balanced. The concept of food variety is central because single flavours, nutrients and secondary compounds all cause animals to satiate, and satiety may be aversive which limits food intake. The satiety hypothesis attributes changes in palatability to transient food aversions due to flavours, nutrients, and toxins interacting along concentration gradients. Gustatory, olfactory, and visual neurons stop responding to the taste, odor, and sight of a particular food eaten to satiety, yet they continue to respond to other foods. If ‘other foods’ are not available, animals stop responding and intake will decrease. Moreover, if monotony is aversive, then animal welfare may be compromised, even if monotony implies consuming a balanced diet. A diverse diet may increase resistance to disease in ruminants, by allowing consumption of small amounts of compounds with antimicrobial/antiparasitic effects and immunity-enhancing properties. Animals that manifest less fear towards the unfamiliar will typically accept more readily new foods, leading to a more diverse diet. Thus, fear responses towards novelty, may interact with availability of diverse foods to influence diet selection. There are at least three lines of evidence suggesting such a relationship in ruminants. First, the neural substrate responsible for the fear response is also involved in diet selection. Neuronal networks in the amygdala and the hippocampus are involved in both fear and diet selection responses. Second, experimental work in some domestic species has shown that when animals are placed in a new environment likely to elicit a stress response, they show a greater reluctance to eat novel foods compared with the same animals being offered new food in a familiar environment. Finally, work with farm animals has shown that environmental enrichment that allows animals to show a more flexible foraging behaviour decreases chronic stress. Individuals also differ in their temperaments and this may explain part of their differences in diet selection. Such differences may originate from experiences with the food (nutrients, toxins, flavours) and non-food (location, predation risk) environments in utero and early in life. Experiences early in life cause changes – neurological, morphological, physiological – in animals that influence their subsequent behaviour. Experiences with the environment enable animals to adapt to local diets, habitats and stressors. This implies that what constitutes a low-quality diet or stressor will differ among individuals reared in different habitats and with different dietary and non-dietary experiences. In conclusion, food diversity and early experiences with food will influence how animals perceive the stress created by the food environment, which will affect animal welfare and performance and thus profitability of the people who manage animals.