

Possible variation in microbiota community structure and composition in same species bred in zoos and a wildlife refuge, and its implications on reproductive success

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Abstract

Considering the difficulty of breeding endangered species in captivity relative to those in the wild, specific environmental factors such as availability of roaming space and nutrition may be important reasons contributing to the relative lack of procreation capability in animals housed in zoos. Like humans, animals acquire their microbiota from the immediate environment they reside as well as from food. Specifically, the environs in which an animal grows and matures as well as nutrition play important roles in modulating the types and relative abundances of different microbes present on different parts of the animal body. Thus, differential microbiota may exist on animals in captivity and in the wild (e.g., a wildlife refuge or a national park), and this may impact on reproductive success. Hence, one research direction that could lay the foundation for understanding the microbiological underpinnings impacting on breeding success of animals in zoos may be the profiling of the gut and skin microbiota of endangered species such as pandas in zoos and in wildlife refuges. In particular, while most panda breeding programs around the world try to recapitulate the conditions and nutrient sources available in the native environment, significant differences remain such as the influence of human contact with pandas on the transfer of microbial species, as well as the amount and type of spaces available for roaming. By using a tracking and periodic sampling approach for understanding the microbial populations in the gut and skin of wild and zoo pandas, knowledge could be progressively accumulated on the microbiological evolution of animals throughout their lives in captivity or in the wild, and correlated with their relative success in procreation. Doing so would help unlock mysteries on fundamental questions of how does human contact and breeding programs change microbiome structure and function in zoo animals relative to wild pandas, and, more importantly, the roles of differential microbiota in health and disease of the animals, which directly impact on reproduction fitness. Taken together, success of breeding programs hinge on multitude of factors ranging from human influence on social behavior of pandas, nutrition, artificial recreated habitat, and microbiological environment of enclosure, but given the important roles of microbial species (alone and in aggregate) on animal physiology and neurobiology, profiling the possible differentiated microbiota of animals in captivity and the wild may be the first incision point for unveiling deeper mysteries of how microbes influence higher order animal function and decision making. Interested researchers can expand on the ideas presented herein.

Keywords: microbiome, captivity breeding, nutrient sources, environmental factors, pandas, intestinal, skin, conservation programme,

Subject areas: zoology, biochemistry, microbiology, conservation biology, animal behavior,

Conflicts of interest

The author declares no conflicts of interest.

Author's contribution

The author thought about possible effects of breeding programs of animals in zoo on the types and relative abundance of microbes on various parts of animal bodies, and would like to share his thoughts on the subject with microbial ecologists and zoologists around the world in an abstract preprint. Readers interested in the topic may expand on the ideas presented in this preprint.

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