**ICVM19S-2772121**

Abstract title

Positive selection and differential expression of olfactory receptors in the domestic dog

Alice Mouton1, Gang Li2, Marco Morselli3, William Murphy2, Robert Wayne1

Department of Ecology and Evolutionary Biology, University of California, Los Angeles, USA

Department of Veterinary Integrative Biosciences, Texas A&M University, College Station

Department of Molecular, Cell and Developmental Biology, University of California, Los Angeles

Abstract

Olfaction is the oldest of the vertebrate special senses and yet remains the least understood. We assess positive selection and differential expression of olfactory receptors in dog breeds of enhanced and diminished olfactory sensitivity. Positive (or directional) selection is among the most extensively studied forms of selection, occurring when an allele is favored by natural selection. However, positive selection on olfactory receptors among breeds and wild canids has not been extensively studied. We analyze sequence data from ~800 olfactory receptors (OR) from multiple individuals from 30 breeds with supposed differences in olfactory sensitivity and 10 gray wolves. We used several analytical methods such as Polysel, PAML and HyPhy to detect positive selection. Our second aim is to assess differential expression of olfactory receptors across breeds that have distinct olfactory abilities. We extracted RNA from 24 epithelial tissues across 23 dog breeds. A first exploration based on gene expression pattern in 344 olfactory genes remaining after filtering for low counts evidenced a pattern of expression according to breed body size rather than the supposed olfaction abilities for the dog. A second analyses based on breed sizes below 20 pounds and above 66 pounds showed that 26 OR genes are upregulated in larger breeds. These preliminary results suggest that breed size might be one important predictor of olfactory abilities in dogs, perhaps due to the greater surface area and likely neurological capacity of the cribriform plate in large dogs.

Keyword

olfactory receptors, dog, positive selection, gene expression