

Introduction

Marine mammals are traditionally considered to have a poorly developed sense of smell according to the interpretation of anatomical studies. However, increasing evidence suggests that pinnipeds (seals) may use their sense of smell in a variety of behavioral contexts including social communication, foraging, food selection, and reproduction.

Aims of this study

- to assess the olfactory discrimination ability of South African fur seals for 12 pairs of enantiomers*.
- to compare their performance to that of other species tested previously on the same set of odor pairs.

*Why enantiomers?

Enantiomers are mirror-imaged odorous molecules, that is, the (+) and the (-) form of a given enantiomer are identical in most of their physical properties but only differ from each other in chirality. Thus, enantiomers are particularly useful for assessing olfactory discrimination abilities.

Results & Discussions

✓ Discrimination performance

- Succeeded with 7 out of 12 odor pairs (corresponding to $p < 0.01$), and 8 out of 12 odor pairs (corresponding to $p < 0.05$).
- No significant differences in performance between the animals were found across all tasks.

✓ Comparisons with other species

The fur seals' performance is not poorer than that of other species previously tested on the same set of odor pairs, rather better than that of humans (5 of 12 odor pairs) and squirrel monkeys (6 of 12 odor pairs).

Methods

Animals and odorants

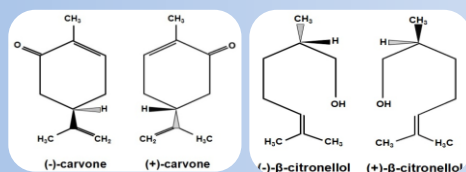
- Four female South African fur seals (*Arctocephalus pusillus*) at Kolmården Wild Animal park, Sweden.
- A set of 12 enantiomeric odor pairs

Behavioral test

The test was based on an operant conditioning. The animals were trained to sniff both odor sampling ports and to chose one of those which presents the rewarded stimuli. The animals recieved 5-8 training sessions (one form of enantiomer vs. pepper oil), and then 4 critical sessions (the (+)-form of enantiomer vs. the (-)-form of enantiomer). One session consists of 20 trials.



C (container), SB (stimulus box), V (ventilator), O (outlet for airflow), OP1 and OP2 (odor sampling ports 1 and 2). The behavior was observed through the mirror attached at top of the cage (not shown in this photo).



Examples of molecular structures of enantiomers

Data analysis

The percentage of correct choices out of 40 trials (the best two consecutive sessions) for each animal was measured. The criteria were set by two-tailed binomial test.

Conclusions

- South African fur seals display a well-developed olfactory discrimination ability with enantiomeric odor pairs.
- Comparisons with other species show that the fur seals at least performed better than human subjects and squirrel monkeys.
- The sense of smell may play an important role in regulating the behavior of fur seals and has been hitherto underestimated.

Olfactory discrimination ability of South African fur seals for enantiomers

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I would like to thank my supervisor Matthias Laska, and all of the trainers at Dolphinarium, Kolmården Wild Animal park, Sweden.

In memory of Flisa, one of the four seals tested in my study...



Contact information: Sunghee Kim
sunki240@gmail.com

Sunghee Kim
Supervisor: Matthias Laska
Linköping University, Sweden