Why King Kong failed to impress

December 8 2009

Humans have the same receptors for detecting odors related to sex as do other apes and primates. But each species uses them in different ways, stemming from the way the genes for these receptors have evolved over time, according to Duke University researchers.

Varying sensitivity to these sex-steroid odors may play a role in mate selection -- and perhaps prevent cross-species couplings, the researchers speculate.

The researchers analyzed the sequences and functions of the gene for the odorant receptor OR7D4 in terms of perceiving two steroid molecules related to testosterone, androstenone and androstadienone. The study did not try to examine how the receptors and odor perception might relate to behavior.

"There's variation in sensitivity of the odorant receptor from this gene (all primates) have," said Hiroaki Matsunami, associate professor of molecular genetics and microbiology and neurobiology at Duke University Medical Center. "Maybe these molecules operate in the process of reproduction. The fact that there is variation fits with this theory. Reproduction demands that an animal avoid attraction to other species, so variation in the receptor's sensitivity to these odors may prevent any cross-species attraction."

The study was published online Dec. 3 in the Early Edition of the Proceedings of the National Academy of Sciences.

Animals rely on olfactory signals to make all sorts of decisions about other animals, particularly in reproduction, said Christine Drea, Ph.D., an associate professor of Biology at Duke who was not involved with this study. "Beyond identifying members of the same species, odors help identify kin or nonkin, members of the opposite sex, even whether individuals are fertile or genetically appropriate as mates. How they do so is still largely unknown," she said. "By deciphering evolutionary changes in receptor function across species, Dr. Matsunami and his colleagues have brought us another step closer to unraveling the mysteries of olfactory signaling."

The odorant receptor gene, which the paper traces back to the mongoose lemur, evolved differently within the various primate species. Human receptors were found to be most closely related to the chimps and bonobo monkeys, as opposed to gorillas and other primates.

The findings support the evidence that primates have a common ancestor, but we are very different now. "One of the differences is in how well we are able to sense odors, which is exemplified by changes in the function of this odor receptor," Matsunami said.

Ultimately, the work will aim at discerning how smelling these chemicals might affect human social and sexual behavior. "We will begin working with a collaborator to examine chimpanzee behavior with regard to odor perception," Matsunami said.

However, the sense of smell also can vary from animal to animal and person to person, because of combinations of a number of odor receptors.

"The sex-steroid related odors act as pheromones in pigs," Matsunami said. "Pigs that are ovulating and that are exposed to the pheromones assume a mating posture. It's debatable whether these chemicals act

similarly in humans. But there is evidence that smelling these odors can affect the mood and physiological state of both men and women. We have a lot more studying to do, but this finding and others in the future will create a picture of how smell may relate to sexual reproduction."

Matsunami added that there are likely other receptors and receptor variants that may also play roles in how these two chemicals are perceived. Because there are about 400 specific smell receptors and humans can detect more than 10,000 different odors, different combinations of receptor genes and variants must be involved in perceiving each odor, Matsunami said.

Source: Duke University Medical Center (news : web)