

# Evidence found of worker naked mole rats who eat queen feces becoming more attentive to young

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Subordinate naked mole-rats and queen's pups. Credit: *PNAS*

A team of researchers affiliated with several institutions in Japan has found evidence suggesting that female worker naked mole rats become more maternal after consuming their queen's feces. In their paper published in *Proceedings of the National Academy of Sciences*, the group describes their study of the unique mammals and what they found.

Naked mole rats are burrowing rodents that live in eastern parts of Africa. They are unique not only because they have no fur, but also because they are blind, and they are the only known mammal to be eusocial—existing in an advanced social structure in which a single female produces all the [offspring](#). With naked mole rats, the single reproducing female is called the queen—female subordinates that care for her offspring have underdeveloped ovaries and thus cannot reproduce. In this new effort, the researchers wondered what mechanism might be involved in compelling the subordinates to exhibit maternal behavior. Since they have no way to produce the hormones often associated with such care, it has been unclear what drives their maternal instincts.

Noting that naked mole rats have been known to eat their own feces, the researchers wondered if they might be eating the queen's feces, as well. If so, they might be absorbing some of the hormones she produces through their digestive systems. To find out, they fed groups of different captive female [worker](#) mole rats different kinds of pellets. Some got pellets with fecal material from a pregnant queen, others got the same only from a queen that was not pregnant. And some got pellets without any fecal material from the queen, while others yet got pellets that had been enhanced with the [hormone](#) estradiol—which is naturally produced by the queen.

In studying the behavior of the [naked mole rats](#), the researchers found that the ones who got the fecal material from the pregnant queen or the added estradiol were more attentive to offspring. They suggest this

indicates that hormones derived from consuming their queens' feces drive the behavior of the subordinate female workers. They note also that just a few subordinate females spend time with the queen, likely making them the primary caregivers of the young. But they suggest that others eating their feces might be getting some of the hormones, too, influencing them to lend a helping hand, as well.

**More information:** Akiyuki Watarai et al. Responses to pup vocalizations in subordinate naked mole-rats are induced by estradiol ingested through coprophagy of queen's feces, *Proceedings of the National Academy of Sciences* (2018). [DOI: 10.1073/pnas.1720530115](https://doi.org/10.1073/pnas.1720530115)

### **Abstract**

Naked mole-rats form eusocial colonies consisting of a single breeding female (the queen), several breeding males, and sexually immature adults (subordinates). Subordinates are cooperative and provide alloparental care by huddling and retrieving pups to the nest. However, the physiological mechanism(s) underlying alloparental behavior of nonbreeders remains undetermined. Here, we examined the response of subordinates to pup voice and the fecal estradiol concentrations of subordinates during the three reproductive periods of the queen, including gestation, postpartum, and nonlactating. Subordinate response to pup voice was observed only during the queen's postpartum and was preceded by an incremental rise in subordinates' fecal estradiol concentrations during the queen's gestation period, which coincided with physiological changes in the queen. We hypothesized that the increased estradiol in the queen's feces was disseminated to subordinates through coprophagy, which stimulated subordinates' responses to pup vocalizations. To test this hypothesis, we fed subordinates either fecal pellets from pregnant queens or pellets from nonpregnant queens amended with estradiol for 9 days and examined their response to recorded pup voice. In both treatments, the subordinates exhibited a constant level of response to pup voice during the feeding period but

became more responsive 4 days after the feeding period. Thus, we believe that we have identified a previously unknown system of communication in naked mole-rats, in which a hormone released by one individual controls the behavior of another individual and influences the level of responsiveness among subordinate adults to pup vocal signals, thereby contributing to the alloparental pup care by subordinates.

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