

## Undergraduate Research Projects

### *Olfactory Enrichment in the Golden Hamster*

Olfactory communication plays an intricate role in the daily activities of the golden hamster (*Mesocricetus auratus*). Olfaction allows these nocturnal, burrowing, solitary, and territorial animals to communicate important individual information to one another and to receive information from their environment (Petruilis & Johnston 1997). The advantages of olfactory communication with the environment seem obvious and not species specific to the golden hamster. Certainly, the most notable of these advantages is efficient territory and nutrient reservations; both of which are commonly aided by olfaction in many animal species. However, *Mesocricetus auratus* is rather unique in its use of olfaction to exchange very specific personal information between individuals on a daily basis. Unfortunately, this fact is often overlooked in enrichment programs for this species (Wilcox & Johnston 1995, Carlstead 1998).

Three main roles in individual communication have been defined: to express individual identity, to distinguish kin from non-kin, and to regulate competitive interactions. Individual identity includes specific personal information about sex, age, social status, and reproductive state (Petruilis & Johnston 1997). By expressing individual identities, the hamsters are able to attract the opposite sex for mating, to mark territories, and to maintain hierarchies. Petruilis & Johnston (1997) identified these functions after obtaining the following behavioral results from olfactory testing on the hamster. Females and males scent mark more when stimulated by the presence of the opposite sex and females were more likely to mark when they were in proestrous. Scent marking by females and males in a "clean" area made subsequent marking by the same sex very unlikely. Subordinates in a group were less likely to mark than dominant figures. Ultimately, the individuals learn when to come together to mate without the ill prospect of injury. They can maintain dominance hierarchies and territories without ever confronting one another. They can discover the unique individual identities of one another while maintaining their innate unsociability. Kin recognition is an important expansion of personal identity communication. Physiological testing has shown that the degree of relatedness between individuals is directly correlated with similarities in their scents. The chemical components in the scents of cousins, for example, are largely the same (Todrank et al. 1998). The same study also gave behavioral proof that the animals are greatly aware of this. The hamsters tested were less likely to investigate the odors of close kin, to react aggressively when the scents of close kin were placed near their home territories, and to mark for siblings of the opposite sex (Todrank et al. 1998). Adaptively, this gives the hamsters the advantage of avoiding inbreeding that produces less viable young. In a competitive sense, olfactory communication allows for self-advertisement (Wilcox & Johnston 1995). This advertisement is associated with territory and nutrient competition, but more specifically with mating competition. Basically, those individuals that can

advertise themselves strongly ultimately gain control of a territory and all of the nutrient reserves and mating rights that come with it (Tang-Martinez 1993).

Olfactory communication provides the primary means for these animals to survive and reproduce in an environment where this may otherwise be impossible. It provides the stimulus for most of their day to day activities, as previously described (Tang-Martinez et al. 1993, Wilcox & Johnston 1995). As olfactory communication is of utmost importance to the hamster in its wild state, it must also be considered in the enrichment of captive animals (Carlstead 1998). In this study, we proposed the use of novel scents to provide for olfactory stimulation of the golden hamster that may be missing due to laboratory housing conditions. We tested the effectiveness of exposure to novel scents in lowering stress and consequent stereotypic behaviors. The novel scents selected were those of a gerbil and of cinnamon. We predicted that these novel odors would decrease stress and stress-related behaviors in the hamsters. The scents were selected because they were readily available, non-toxic if ingested, and completely unfamiliar to the animals. We opted not to use another hamster's scent because we felt it would be antagonistic to the experimental hamsters. They were enclosed in a confined space during testing and did not have the option of leaving the scent at will, as they would in the wild. It seemed that novel scents would serve our purpose much better. Unfortunately, we had to choose the experimental scents rather randomly because there was not much previous data in this area to base the decision on.