Chromosome banding and phylogenetics of the golden mouse, *Ochrotomys nuttalli*

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**Abstract**

The number and location of nucleolus organizer regions, and G- and C-band karyotypes of *Ochrotomys nuttalli* were compared with those of other seemingly closely related New World peromyscine rodents. Although *Ochrotomys* was once considered a subgenus of *Peromyscus*, it shares few apparent G-band homologies with any peromyscline. The presumed homologous karyotypic elements shared between *Ochrotomys* and other peromyscine genera also are shared with *Neotoma* (the probable sister group of peromyscines) and these elements are hypothesized to be primitive for the group. The largest autosome in *Ochrotomys* appears to be shared with a distantly related species, *Sigmodon hispidus*, and this chromosome might be represented as two acrocentric autosomes (tandem fission products) in peromyscines and *Neotoma*. If this hypothesis is correct, the peromyscines as currently recognized likely are polyphyletic. The unusually extensive rearrangement of the *Ochrotomys* karyotype relative to peromyscines appears to represent a case of karyotypic megaevolution.

**Introduction**

Peromyscine rodents (sensu Hooper & Musser, 1964) seemingly comprise a closely related assemblage of primarily North American genera characterized, in part, by a simple glans penis and baeulum (for an alternative viewpoint see Carleton, 1980). Hooper & Musser (1964) included the genera Baiomys, *Neotomodon*, *Ochrotomys*, *Onychomys*, *Peromyscus* and *Reithrodontomys* within the peromyscines and regarded the group as monophyletic. *Baiomys*, *Neotomodon*, *Onychomys* and *Peromyscus* are characterized by 2n = 48 and G-banded karyotypes of representatives of each genus have been reported (see reviews by Baker et al., 1979; Robbins & Baker, 1981, and Yates et al., 1979). The degree of chromosomal homology among these four taxa is high and identification of shared primitive and shared derived elements has been used to define cladistic relationships among them (Baker et al., 1979; Yates et al., 1979). Robbins & Baker (1980) examined banding patterns of four species of *Reithrodontomys* ranging in diploid number from 38 to 50 and found little homology among the species; however, *R. fulvescens* (2n = 50) was closely allied to other peromyscine genera and possessed several chromosomal elements hypothesized as primitive for the group. Banded karyotypes are not available for the genera *Ochrotomys* (2n = 52; Patton & Hsu, 1967), and *Scolionomys* (2n = 58; Carleton et al., 1975).

The genus *Ochrotomys* is monotypic and consists of the golden mouse (*O. nuttalli*) which has a distribution limited to the southeastern United States. *Ochrotomys* was considered a subgenus of *Peromyscus* by Osgood (1909) but more recent morphological (see reviews by Packard, 1969; Carleton, 1980), chromosomal (Patton & Hsu, 1967), and biochemical (Aquardo & Avise, 1981; Patton et al., 1981) evidence indicates that golden mice com-
prise a distinct genus. Based on phallic morphology, Hooper & Musser (1964) placed *Ochrotomys* as the nearest outlier to a group containing *Neotomodon, Peromyscus, and Reithrodontomys*, whereas Carleton (1980) and Patton et al. (1981) regarded *Ochrotomys* as the basal clade of the peromyscines based on cladistic analyses of morphological and electrophoretic characters, respectively. The purpose of our study, based on banded-chromosome morphology, was to assess the phylogenetic position of golden mice relative to other peromyscine genera and provide a test of the morphological and biochemical phylogenies.

**Methods and materials**

Twenty-four specimens of *O. nuttalli* were sampled from natural populations and standard karyotypes were prepared for each using the in-vivo bone-marrow technique of Patton (1967) as modified by Lee (1969). Ear biopsies were taken in the laboratory and grown in Hams F-10 fortified with 16% of a 1 to 1 solution of fetal and newborn calf serum, at 37 °C. Actively dividing cells were harvested and G-bands produced using the technique of Seabright (1971) modified by treating slides for three min in Trypsin heated to 40 °C. C-bands were prepared using a modification of the technique of Stefos and Arrighi (1971) and nucleolus-organizer regions (NORs) were identified by the Ag-As silver staining technique of Goodpasture & Bloom (1975). Five specimens were examined using all techniques.

The following voucher specimens are on deposit in the Texas Cooperative Wildlife Collection, Texas A&M University (numbers in parentheses indicate sample size): Texas: Hardin Co.; 1 mi N, 5.5 mi E Saratoga (2), 10.5 mi N, 3 mi E Silsbee (9); Polk Co.; 3.5 mi N, 3.7 mi W Dallardsville (2), 3.4 mi N, 0.4 mi W Segno (7), 1 mi N, 0.3 mi W Segno (4).

**Results**

The autosomal complement of *Ochrotomys nuttalli* (Fig. 1; see also Patton & Hsu, 1967) consists of 11 pairs of large to small metacentric to subtelo-centric chromosomes and 14 large to small acro-