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CHROMOSOME ANALYSIS AND MEIOTIC BEHAVIOR OF *PEROMYSCUS TRUEI GRATUS*

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ABSTRACT

In *Peromyscus truei gratus* from the Pedregal de San Ángel (México, D. F.) the chromosome number is 2n = 48, as has been found in other species, subspecies and populations of this genus. The chromosomic complement is very similar to the one found in *Peromyscus truei* proceeding from New Mexico (USA). In meiosis, 23 bivalents were observed in parallel; the sex chromosomes were found to assume a peculiar disposition, "in tandem", forming a X-Y complex with a very small pairing segment. The X-chromosome in pachythene takes a ring shaped form.

RESUMEN

En *Peromyscus truei gratus* del Pedregal de San Ángel (México, D. F.) el número de cromosomas es 2n = 48, como en las otras especies, subespecies o poblaciones del género. El complemento cromosómico es muy semejante al encontrado en *P. truei* procedente de Nuevo México (USA). Durante la meiosis se observaron 23 bivalentes en paralelo y los cromosomas sexuales asumen una disposición particular, "en tandem", formando un complejo X-Y con un segmento de apareamiento muy pequeño. El cromosoma X en el paquiteno tiene forma anular.

INTRODUCTION

Since the paper of Cros (1938) on the cytogenetics of *Peromyscus* many communications dealing with the complement of various species of this genus have been reported (Sparkes and Arakaki, 1966; Ohno *et al.*, 1966; Hsu and Arrighi, 1966; Singh and McMillan, 1966; Patton and Hsu, 1967; Hsu and Arrighi, 1968). All authors agree with a constant chromosome number for the genus, both interspecifically and intraspecifically, even in cases of total isolation. Nevertheless, there were found qualitative differences among the karyotypes of different species and even among populations of the same species spread in different regions.

The aim of this paper is to report observations concerning the karyotype and chromosome behaviour during meiosis of *Peromyscus truei gratus*.

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MATERIAL AND METHODS

A total of 10 specimens of *P. truei gratus* (6 males and 4 females) collected in the Pedregal de San Ángel (México, D. F.) were studied.

The animals were injected with 0.1 ml/10 g body weight of a 0.04% colchicine solution and after 2hr 30 min they were sacrified. Chromosome spreads from bone marrow, spleen and testes were obtained and permanent slides were prepared following routine techniques as described elsewhere (Beçak and Paulete, 1970; Ford and Evans, 1969). In each animal no fewer than 20 metaphases from each processed tissue were analyzed. The relative length, arm ratio and centromeric index for each chromosome were determined. All data were statistically analyzed.

RESULTS

The 10 studied specimens of *Peromyscus truei gratus* had a diploid number of 2n = 48 chromosomes, and a fundamental number NF = 58. The analysis of the complement showed the existence of 23 pairs of autosomes (2 pairs of metacentric chromosomes, 2 pairs of subterminal and 19 pairs of acrocentric ones). The X-chromosome was large and was also the second in size among the subterminal elements. The Y-choromosome was a small metacentric one; as it determined that by its size, it was between the 19th and 20th pairs of autosomes (Fig. 1, table 1).

The study of male meiosis showed the existence in spermatocytes of 23 bivalents. The X-chromosome was distended showing negative heteropycnosis; the Y-chromosome which showed positive heteropycnosis was connected end-to-end with the short arm of the X-chromosome (Fig. 2).

DISCUSSION

P. truei shows qualitative Karyotype differences when samples are obtained in different regions. Hsu and Arright (1968) studying specimens collected in New Mexico, Utah and California (USA) found variations in the number of biarmed chromosomes ranging from 5 to 10 pairs. *P. truei gratus* from "Pedregal de San Ángel" and *P. truei* from New Mexico show a quite similar karyotype regarding the morphology, either of autosomes or of sex-chromosomes. *P. truei* of New Mexico, meanwhile, does not seem to differ from *P. californicus* except by the Y-chromosome which is larger and metacentric. Notwithstanding, *P. truei* collected in California is cytogenetically similar to *P. gossypinus*.

The X-chromosome of *P. truei gratus* shows a segment pairing itself which allows it to become annular. Probably, this pairing segment corresponds to a repetitive segment. Nevertheless, most of its length is a non-pairing of differential segment. John and Lewis (1965) and Ohno (1967) consider that the sex-chromosomes tendency is to lose gradually their pairing segments as they evolve. The final product being allochromosomes with no pairing segments, but only differential ones. Then, it is possible to assume that *P. truei gratus* must be a

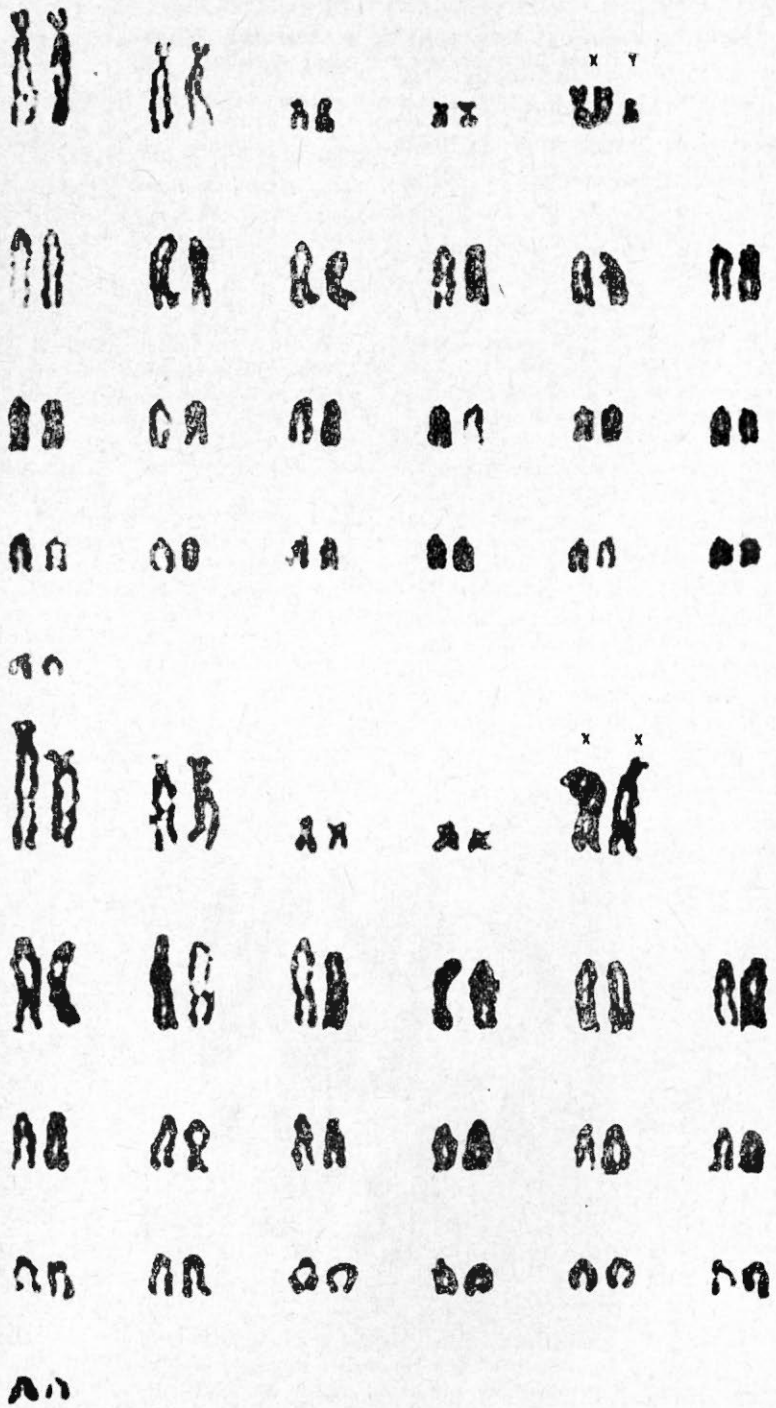

Fig. 1. Karyotype of *Peromyscus truei gratus*.

TABLA 1

RELATIVE VALUES FOR IDENTIFICATION OF CHROMOSOMES OF *PERYMYSCUS TRUEI GRATUS*

Chromosome	*Relative Length*	*Arm Ratio*	*Centromeric Index*	*Classification*
1	94.52	3.97	20.2	st
2	70.39	3.35	23.4	st
3	29.11	1.54	39.8	m
4	27.26	1.47	40.8	m
5	65.21			a
6	60.53			a
7	56.10			a
8	50.23			a
9	46.12			a
10	43.31			a
11	40.31			a
12	38.06			a
13	35.52			a
14	33.15			a
15	31.54			a
16	30.18			a
17	29.11			a
18	27.97			a
19	26.80			a
20	25.78			a
21	24.24			a
22	22.40			a
23	19.40			a
X	72.75	3.36	23.0	st
Y	26.39	1.23	44.4	m

Fig. 2. The Y-chromosome showing positive heteropycnosis connected end-to-end with the short arm of the distended X-chromosome which shows negative heteropicnosis.

quite ancient species since it has lost many pairing segments. This hypothesis agrees with Hsu (1968) who places *P. truei* among the older forms, from a cytogenetic point of view.

Meiotic analysis revealed the presence, in the pachytene, of two vesicles, a large and a smalle one. These are similar to those found in *Chiroptera* (Beçak *et al.*, 1969) and in *Primates* (Egozcue *et al.*, 1968; Egozcue, 1969). On the other hand, meiotic analysis also shows that Y-chromosome has early replication while X-chromosome is a late replicating one.

LITERATURE

Beçak, M. L., R. F. Batistic, L. D. Vizotto y W. Beçak, 1969. Determining mechanism XY_1Y_2 in *Artibeus lituratus lituratus* (Chiroptera-Phylostomidae). *Experientia 25*: 81-83.

Beçak, W. y J. Paulete, 1970. Técnicas de Citología e Histología. 1a. ed. Nobel, S. A., São Paulo, Brasil; p. 253.

Cross, J. C., 1938. Chromosomes of the genus *Peromyscus*. *Cytologia 8*: 408-419.

Egozcue, J. B. Chiarelli y M. Sarti-Chiarelli, 1968. The somatic and meiotic chromosomes of *Cebuella pygmea* with special reference to the behavior of the sex chromosomes during spermatogenesis. Folia Primat *8*: 50-57.

Egozcue, J., 1969. Meiosis in five Macaca species. *Folia Primat 11*: 1-16.

Ford, C. E. y E. P. Evans, 1969. Meiosis in mammals. *In*: Kurt Benirschke (Ed.) *Comparative Mammalian Cytogenetics*. An international conference at Dartmouth Medical School in Hanover, New Hampshire. Springer-Verlag, New York Inc: 461-462.

Hsu, T. C. y F. E. Arrighi, 1966. Chromosomal Evolution in the Genus *Peromyscus* (Cricetidae, Rodentia). *Cytogenetics 5*: 355-359.

———, 1968. Chromosomes of *Peromyscus* (Cricetidae, Rodentia). I. Evolutionary trends in 20 species. *Cytogenetics 7*: 417-446.

John, B. y K. R. Lewis, 1968. The chromosome complement. *Protoplasmatologica 6*: 1-206.

Ohno, S., C. Weiler, J. Poole, L. Christian y C. Stenius, 1966. Autosomal polymorphism due to pericentric inversion on the deer mouse (*P. maniculatus*) and some evidence of somatic segregation. *Chromosoma 18*: 177-187.

Ohno, S., 1967. Sex chromosomes and sex-linked genus. Springer-Verlag. New York.

Patton, J. L. y T. C. Hsu, 1967. Chromosomes of the golden mouse, *Peromyscus* (*Ochtromys*) *nuttalli* (Harlan). *J. Mammal. 48*: 637-639.

Singh, R. P. y D. B. MacMillan, 1966. Karyotypes of three species of *Peromyscus*. *J. Mammal. 47*: 261-266.

Sparkes, R. S. y D. T. Arakaki, 1966. Intrasubspecific and intersubspecific chromosomal polymorphism in *Peromyscus maniculatus*. *Cytogenetics 5*: 411-418.