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The Sex Chromosomes of the Mink*

By

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(With 2 Text-figures)

Recent rapid advances in cytogenetic techniques involving colchicine and hypotonic pretreatments in combination with the tissue culture method in mammals have facilitated precise and reliable analyses of chromosomes with surprising expansion of cytogenetic knowledge in mammalian species including man. Under the suggestion and direction of Professor Sajiro Makino, a chromosome survey has been going on in various kinds of animals. In this paper, the chromosomes of the mink, *Mustela vison* (Carnivora, Mustelidae) are reported, with special regard to the sex chromosomes.

Material and Method: Materials for this chromosomal study were derived from two strains with the following color phases, Sapphire and Pastel, through the courtesy of Dr. Gizo Shiota. Four Sapphire and 2 Pastel minks which were bred in the Shiota Mink Farm provided the materials. The chromosomes were examined exclusively with bone marrow cells. Bone marrow tissues were taken from tibia bones immediately after sacrifice. The specimens thus obtained were placed in 15 ml test tubes containing 8 ml of culture medium (NCTC 109), and 2 ml of calf serum. The tubes were stood at room temperature for 2 to 3 hours. The specimens were incubated at 37°C for 1 to 2 hours under the influence of 0.25 μ /ml. colchicine treatment. Then, they were centrifuged at 1,000 r.p.m. for 5 minutes. The sedimented marrow cells were treated with a hypotonic KCl solution (0.075 M) for 30 minutes at room temperature, fixed with methanol-acetic acid (3:1) air-dried on clean slides, and stained with Giemsa. Five slides were made from each specimen for chromosomal observation.

Findings and Remarks

The study was carried out on the basis of 19 metaphase cells from males and 38 from females. The number of chromosomes was determined as $2n, 30$ in both sexes. Morphological analysis revealed that the diploid complement consisted of 14 homologous pairs of autosomes and a pair of the sex chromosomes. Fourteen pairs of autosomes were tentatively divided into seven groups according to their size and position of centromere. The first group consists of 4 pairs of large metacentric or submetacentric chromosomes; they numbered 1 to 4. Chromosomes forming

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the no. 1 pair are represented by the largest metacentrics. Chromosomes nos. 2 to 4 are morphologically similar to each other, but chromosomes of no. 2 pair are remarkable by carrying a secondary constriction on their long arms. The second group comprises 3 pairs of large submetacentric or subtelocentric chromosomes and numbered 5 to 7. The chromosomes no. 5 are submetacentric in appearance, while those of no. 6 are of subtelocentric nature. No. 7 chromosomes are submetacentric in structure, having centromeres more medially inserted than in no. 5 chromosomes.

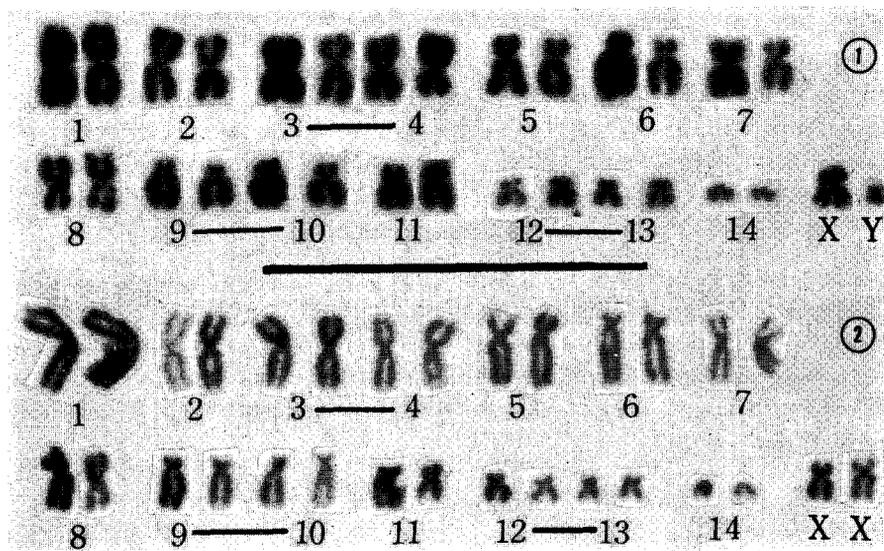


Fig. 1-2. Karyotypes from bone marrow metaphases of the mink. 1, male (30, XY). 2, female (30, XX).

The third group consists of one pair of medium sized submetacentric chromosomes. No. 8 chromosomes have a secondary constriction on their long arms. The fourth group contains 2 pairs of medium sized subtelocentric chromosomes (Nos. 9 to 10). There is no apparent size difference between the chromosomes of the two pairs. The fifth group consists of one pair of small submetacentrics. The chromosomes of this pair (no. 11) are identical in size to the X chromosome. The sixth group includes 2 pairs of small submetacentrics, designated as nos. 12 and 13. The last pair, no. 14, is represented by the two smallest telocentrics: they are readily identified on account of their smallest length and telocentric in general appearance.

The X chromosome was recognized, on the basis of morphological analysis, as one of smaller medium-sized elements. It approximates in size the chromosomes of no. 11, and submetacentric in appearance. But the X has a somewhat more medially inserted centromere than in the no. 11 chromosomes. On the basis of this

feature, the X chromosome is rather readily distinguishable from those of no. 11. The Y chromosome is the smallest in the complement. It is submetacentric in structure, but because of its small size, it is generally difficult to demonstrate the two arms by routine techniques.

Referring to the literature it becomes evident that the chromosomes of the mink (*Mustela vison*) have been studied by Shackelford (1947), Lande (1957), Humphrey and Spencer (1959), Fredga (1961), Shiota and Sasaki (1962) and Nes (1962) reported the diploid number of the mink as 30, while Shackelford and Wipf (1947) found 28 chromosomes in diploid. Current knowledge of mammalian cytogenetics indicated that the correct number of the chromosomes in the mink (*Mustela vison*) was $2n, 30$, having an XY complex in the male and an XX in the female. The results of the present investigation agree well with the above findings. Lande (1957), and Humphrey and Spencer (1959) reported that the Y chromosome was difficult to distinguish from the two smallest autosomes. Shiota and Sasaki (1962) and Nes (1962) stated that the Y chromosome was defined on account of its submetacentric nature from the two smallest autosomes. The present investigation has confirmed their findings. Makino (1952) reported $2n, 38$ and $n, 19$ in *Mustela itatsi itatsi*, a wild species of weasels common in Japan, based on a study with the old testis-section method. This number was confirmed by the study with spleen cultures by Makino and Muramoto (1966). The karyotype of the mink differs considerably from that of the Japanese wild weasel, notwithstanding that the above two species are considered taxonomically as closely related species.

Summary

Somatic chromosomes were studied in the mink, (*Mustela vison*), with direct method of the bone marrow. The diploid chromosome number was determined as 30. The X chromosome is represented by a smaller medium-sized submetacentric element, similar in size to no. 11 chromosomes, while the Y is the smallest one, being submedially inserted.

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