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Chromosome Complement: A Fertile Hybrid between Equus prjewalskii and Equus caballus

Abstract. *At the Zoological Garden of Antwerp it has been proved that when* Equus prjewalskii *is crossed with* E. caballus *the offspring is fertile. As expected, its diploid chromosome number is 65. The morphological differences between the parental and the offspring karyotypes are not great; therefore, meiosis in the hybrid was successfully achieved.*

A difference between the diploid chromosome numbers of *Equus caballus* ($2N = 64$) and *E. prjewalskii* ($2N = 66$) has recently been reported (*1*). For a long time, one of us was of the opinion that *E. caballus* and *E. prjewalskii* in fact represented two different species of the horse family. As no living hybrids were known to exist, experimental breeding between Prjewalski's horse and the domestic mare was undertaken at the Zoological Garden of Antwerp. Two races of *E. caballus*, the Norwegian fjord pony and the Pyrenees pony, had been selected for this purpose since they were geographically the most distant from Mongolia, the habitat of *E. prjewalskii*. Further experiments proved that one of the two resulting male hybrids was fertile (*2*). This stallion, born in March 1962, impregnated late in 1964 a female Pyrenees pony, which gave birth to a female "¼ of hybrid." We then undertook karyotype studies of the fertile hybrid to obtain indirect confirmation of Benirschke's results and to assess probable reasons for the animal's fertility. However, for completeness, not only the chromosome complement of the hybrid, but also the karyotypes of its parents, a male Prjewalski's horse [Ludwig-Koedie studbook number 87 (*3*)] and a female Norwegian fjord pony, were examined.

We used blood cultures according to the method of Moorhead *et al.* (*4*). Results are reported in Table 1. The diploid number of 66 for *E. prjewalskii* was confirmed, directly and indirectly, by the fact that the hybrid has 65 chromosomes. The Norwegian

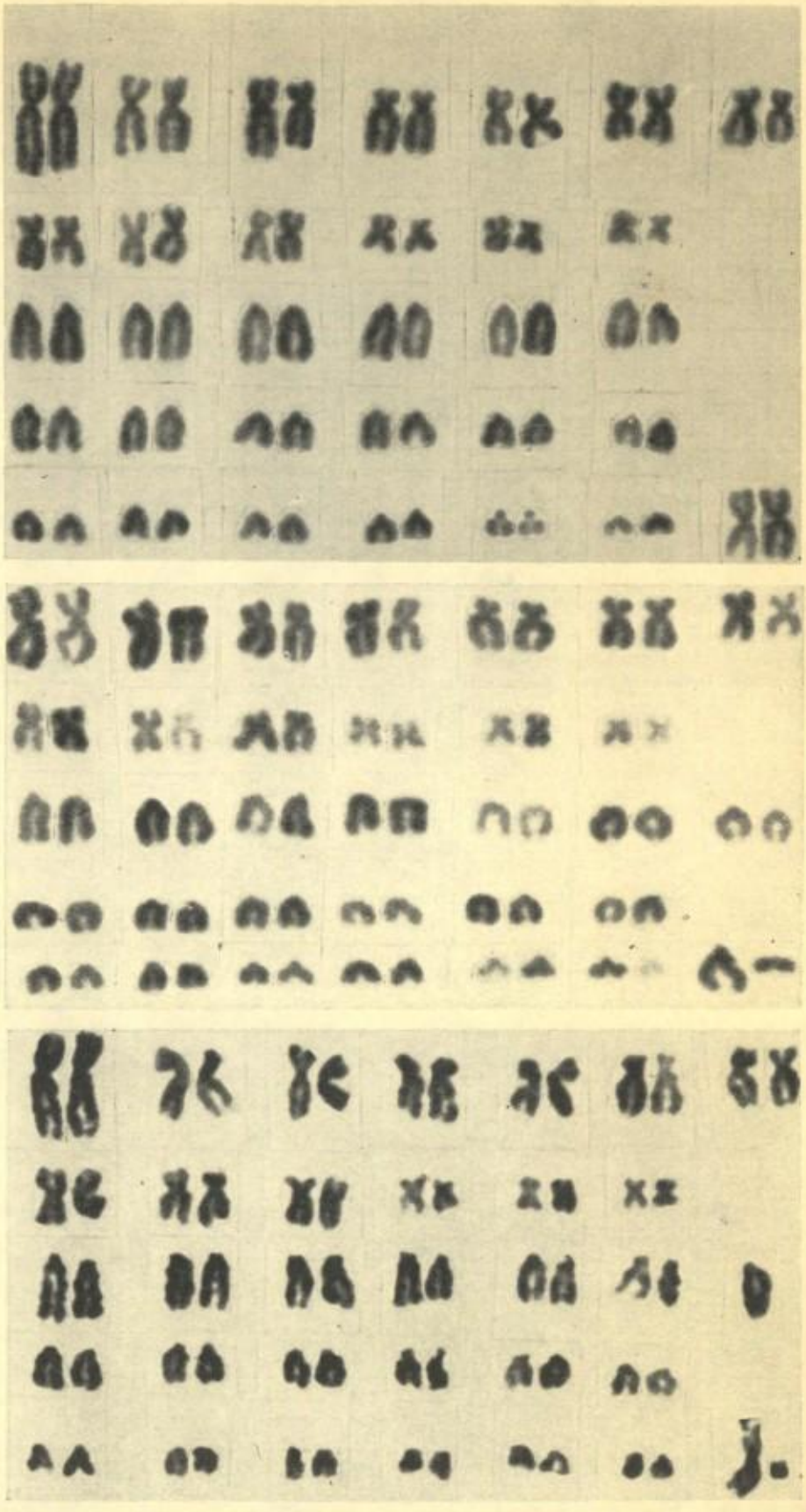

Fig. 1 (Top). Karyotype of a metaphase from the Norwegian fjord pony. (Middle) Karyotype of a metaphase from *E. prjewalskii*. (Bottom) Karyotype of a metaphase from the hybrid. The metacentric chromosomes are ranged in the first two rows. Their morphology and number are identical for the three animals. The acrocentric chromosomes are in the last two rows. Prjewalski's horse has two more of these, and the hybrid has one more, than the domestic horse. The sexual chromosomes are at the right of the last acrocentric row.

fjord pony has a diploid number of 64, as do all other specimens of *E. caballus*.

In the absence of a model of karyotype for the horse (*1*), we followed Benirschke's classification and grouped the chromosomes into two series, the metacentrics and the acrocentrics. Fifteen karyotypes per horse were reconstructed. A model for each specimen is proposed (Fig. 1). The number and the morphology of the metacentric autosomes seem identical for the three species. The variations in the diploid numbers are due to the acrocentric chromosomes—there are two more in *E. prjewalskii* and one more in the hybrid than in *E. caballus*. The general trend of a correlation between a high diploid number and a high number of acrocentrics has been found (*6*). However, a Robertsonian reduction of the total number of chromosomes from the "primitive" to the recent form is not apparent. Indeed, only a study of meiotic figures would elucidate this question definitely, and only such a study would permit the formation either of an autosomal trivalent or of an autosomal univalent to be observed. Unfortunately, fragments of the hybrid's gonads are presently not available. Nevertheless, we believe that our findings could account for the fertility of the hybrid; achievement of meiosis seems to be possible without important chromosomal rearrangements.

Our breeding program is in progress, along with somatic cytogenetic studies. The chromosomes of the offspring of the hybrid ($2N = 65$) and *E. prjewalskii* ($2N = 66$) will be of interest to investigate. We will be able to observe a horse with 66 chromosomes and a karyotype morphologically very similar to (if not identical with) the karyotype of *E. prjewalskii*, despite the fact that this animal may not be a pure Prjewalski's horse. This situation indeed would raise questions about the specificity of karyotype studies of specimens from zoological families with living, fertile hybrids.

Table 1. Distribution of chromosome numbers in analyzed metaphases for each horse studied.

62	63	64	65	66	67
Norwegian fjord pony ♀					
1	1	48			
Prjewalski's horse ♂					
		1	1	37	1
Hybrid ♂					
	2	5	43		

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References and Notes

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