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Constitutive heterochromatin in the fallow deer (*Cervus dama*)

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Previous investigations on the karyotype of *Cervus dama* L. used conventional staining techniques (GUSTAVSSON 1965; HSU and BENIRSCHKE 1967; WURSTER and BENIRSCHKE 1967; GUSTAVSSON and SUNDT 1968) and found a somatic, diploid chromosome number of $2n = 68, XX$ resp. XY . More recently, fluorescence and banding techniques which allow to differentiate between single chromosomes were used by NEITZEL (1982), WANG and DU (1983), KARLIK (1984) and MAYR et al. (1987a, 1987b). These investigators have used a wide spectrum of banding techniques, but one of the most helpful techniques for studying the constitutive heterochromatin, the C-banding-technique, has not been applied. The purpose of the present paper is to study the constitutive heterochromatin of *Cervus dama* with this technique and to compare the results with the relatively large amount of data published for the red deer (*Cervus elaphus*, GOLDONI et al. 1984; HERZOG 1985, 1987b).

Lymphocyte cultures of 25 fallow deer (*Cervus dama* L.) from Niedersachsen (Federal Republic of Germany) were laid out in order to obtain metaphase chromosomes. The procedures of blood culture and chromosome analysis followed modified standard protocols, described in detail by HERZOG (1988).

The somatic, diploid chromosome set of all animals studied consists of 68 chromosomes, namely 66 autosomes and two gonosomes ($2n = 68, XX$ resp. XY ; fig. 1). 32 autosome pairs and the X-chromosomes are telocentric (according to the terminology of NAGL 1980) with an arm length ratio less than 1:4, whereas the Y is small and submetacentric. One autosome pair is metacentric.

The centromeric index (c.i.) is not useful for the characterisation of the chromosomes, because the p-arms of the telocentrics are very small, to identify only in good preparations and therefore not unequivocally measurable. In addition, the chromosome lengths of the related chromosome pairs show only slight differences (see Fig. 1).

All telocentric autosomes as well as the X-chromosome exhibit distinct C-bands of different size in the centromeric region. The Y shows no distinct C-bands, but the whole chromosome is relatively dark stained i.e. heterochromatic. The metacentric autosome pair shows only slight C-bands.

C-banding reveals a high degree of congruence between fallow deer and red deer; the karyotypes of both species show only slight differences, especially in the form of the Y-chromosome. Similar results have been obtained by MAYR et al. (1987b) for the G-banded karyotype. As the proposition for a C-banded idiogram shows, the differences in the C-banding pattern between both species are of the same magnitude as between different individuals of one species or even different metaphases of the same individual.

The metacentric autosome pair ("pair 1") is also detectable in red deer (*Cervus elaphus*, GOLDONI et al. 1984; HERZOG 1985, 1987b) and sika deer (*Cervus nippon*, HERZOG 1985, 1987a). The C-banded telocentric autosomes are very similar to those of the red deer (fig. 1). The male gonosome was found to be metacentric in red deer from Western Germany (HERZOG 1985, 1987b) and unknown origin (MAYR 1987b), but acrocentric in deer from



Fig. 1. C-banded karyotype (example) of a male *Cervus dama* from Niedersachsen (West Germany). The designation of the chromosome 1 and the gonosomes follows a standardized idiogram of *Cervus elaphus* (HERZOG 1987b)

Italy (GOLDONI et al. 1984), whereas in fallow deer it has been described as submetacentric in the present study as well as by all previous authors.

The results of the karyotype comparison between red deer and fallow deer are surprising insofar as e.g. the red and the sika deer, two easily interbreeding species (e.g. HARRINGTON 1979), differ much more in their karyotypes than the red and the fallow deer, but no hybrids are reported between fallow and red deer. This means that a reproductive barrier between them may not primarily be caused by karyological incompatibility but by other physiological (e.g. immunological) or behavioral factors.

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