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SHORT REPORT

Chromosome number polymorphism in a litter of European wild boar (*Sus scrofa scrofa* L.)

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Populations of wild boar (*Sus scrofa scrofa* L.) of Central Europe frequently demonstrate polymorphism in chromosome number. This phenomenon is caused by chromosome rearrangements of the centric fusion type. The presence of Robertsonian translocations in the wild boar population may lead to one of three different karyotypes: 2n=36, 2n=37 and 2n=38. The aim of the study was to analyse the karyotype of five wild boar piglets (two gilts and three boars) originating from one litter, by unknown parents. The GTG-banding technique demonstrated that one boar was characterized by karyotype 38,XY, two gilts (37,XXt.rob15;17) and one boar (37,XYt.rob15;17) were heterozygotic translocation carriers while one boar (36,XYt.rob15;17) was a homozygotic carrier for a Robertsonian translocation including chromosomes 15 and 17. Thus, in this particular litter the chromosome number polymorphism was shown. A Mendelian segregation was found of the 15;17 translocation in the piglets (1:2:1 ratio) whose parents were possibly heterozygotic carriers of 15;17 centric fusion.

KEY WORDS: chromosomes / polymorphism / Robertsonian translocation / wild boar

The normal karyotype of domestic pig (*Sus scrofa domestica* L.) contains 2n = 38 chromosomes. The karyotypes of both domestic pig and wild boar (*Sus scrofa scrofa* L.) are very similar, those of individuals with 38 chromosomes being identical [Gustavsson *et al*. 1973]. However, populations of the wild boar frequently demonstrate

chromosome number polymorphism [Hansen-Melander and Melander 1974] caused by chromosome rearrangements of the centric fusion type.

The existence of the diploid chromosome numbers 36 and 37 in the wild boar was first observed in the population of the Tellico Wildlife Management Area, Tennessee, USA. European wild boars were imported to USA in 1912 from Germany [McFee *et al*. 1966]. Later investigations performed on domestic pigs and wild boars from Europe showed variation of diploid chromosome numbers of 36-37-38 [Bosma 1976, Gustavsson *et al*.1973, Troshina *et al*. 1985, Golish 1989].

In this report described is the karyotype of five piglets originating from one litter of wild boar.

Material and methods

The karyotype of five piglets was analysed – three boars (nos. 1 , 2 and 5) and two gilts (nos. 3 and 4) originating from one litter of wild boar. The animals were found in a forest in the South-West region of Poland, near Wrocław, at the age of about one day. Their mother was dead and father remained unknown.

Blood samples were taken from jugular vein to sterile tubes containing heparin. The preparations with metaphase spreads were obtained after the routine lymphocyte culture. The 72-hour lymphocyte culture was performed from whole blood in standard medium (RPMI 1640 – BIOMED, Lublin, Poland) supplemented with 15% of foetal calf serum. Penicillin and streptomycin were added (100 IU/mL and 0.1 mg/ml of culture medium, respectively, both from POLFA Tarchomin, Poland), and pokeweed mitogen (2.5 µg/mL of culture medium, SIGMA, St. Louis, USA).

For chromosome staining, conventional Giemsa staining and the GTG-banding technique were applied. G-bands were obtained according to Wang and Fedoroff [1972] with minor modifications. Chromosome spreads, about three week old, were treated with 0.1% trypsin solution in GKN/versenian buffer for 2 min., washed quickly in GKN buffer and stained for 25 minutes in 5% Giemsa solution in Sörensen′s buffer, pH = 6.8.

A hundred 100 Giemsa-stained metaphase spreads/animal were analysed.

The karyotypes were prepared according to the recommendation of the Committee for the Standardized Karyotype of Domestic Pig [1988].

Results and discussion

Generally, defined chromosome number and structure are characteristic of animal species, but in some cases different types of structural rearrangements have been observed. If these rearrangements are widely spread into the whole population, the chromosome number has a different formula in one species. The variation in chromosome number in various species seems to be related to the processes of evolution [Bosma 1976, DeHaan *et al*. 1992].

Wild boar of Central Asia (S.s. *nigripes* L.) and Central Europe (S.s. *scrofa* L.) show

chromosome number polymorphism caused by Robertsonian translocations. The Asian subspecies is characterized by fusion of chromosomes from 16 and 17 pairs while the European subspecies by fusion of chromosome15 and 17 [Troshina *et al*. 1985]. In the present investigation 15;17 centric fusion was diagnosed in the Polish wild boar.

Boar no. 1 was characterized by a diploid chromosome number of 2n = 38, boar no. 2 and gilts nos. 3 and 4 by 2n = 37, and boar no. 5 by 2n = 36 chromosomes. The karyotype of boar no. 1 comprised 38 chromosomes, of which 24 were metacentric or submetacentric autosomes, and 12 acrocentric autosomes and sex chromosomes – (XY (38,XY). This karyotype formula was found identical with the domestic pig karyotype given by the Committee for the Standardized Karyotype of the Domestic Pig [1988].

Boar no. 2 had a karyotype consisting of 25 metacentric and submetacentric autosomes, 10 acrocentric autosomes and XY sex chromosomes. A similar karyotype formula was found in gilts nos. 3 and 4 – 25 metacentric and submetacentric autosomes and 10 acrocentric autosomes, but sex chromosomes were XX. In the no. 5 boar 36 autosomes were revealed in which 26 structures were metacentric and submetacentric, eight acrocentric and two sex chromosomes – XY.

The GTG-banding technique was applied for identification of chromosome in particular pairs (Fig.1 A, B). In the piglets nos. 2, 3, 4 and 5 the Robertsonian translocation was consisted with 15 and 17 chromosomes (t.rob 15;17) in heterozygotic (piglets nos. 2, 3, 4) or homozygotic form (piglet no. 5). It is concluded that the parents of analysed piglets were possible heterozygotic carriers of 15;17 centric fusion.

Moreover a Mendelian segregation of the 15;17 translocation appeared among the piglets (1:2:1 ratio).

Rary *et al*. [1968] and DeHaan *et al*. [1992] described 13;17 centric fusion in the domestic pigs. However 13;17 Robertsonian translocation, characterized by low frequency, was well fixed in pig's karyotype. It could also be the reason for chromosome number polymorphism in *Suidae*.

Wild boars crossed with domestic pigs often show the karyotype 2n = 38. Although Sysa [1980] using GTG-banding technique diagnosed 15;17 Robertsonian translocation in domestic pig × Polish wild boar cross, the authors of the present report did not find the centric fusion in 20 such hybrids from an experimental station of the National Institute of Animal Production (unpublished data).

All the studies showed that in fusion were engaged chromosomes 13, 15, 16 and 17, and no translocation has been diagnosed concerning 14 and 18 chromosomes.

The three different karyotype formulas (38,XY, 37,XX t.rob.15;17 and 36,XY trob.15;17) suggest that the parents of investigated litter were both trob.15;17 carriers in heterozygotic form (37,XY, t.rob15;17 x 37, XX, t.rob15;17). The chromosome number 2n = 36 in wild boar populations from the Netherlands and from Tennessee (imported from Germany) was identified in 73% of animals, 2n = 37 in 7% of animals from the Netherlands and 27% from Tennessee, and 2n = 38 in 20% of the population from the Netherlands [Rary *et al.* 1968, Bosma 1976]. However in four populations of wild boar

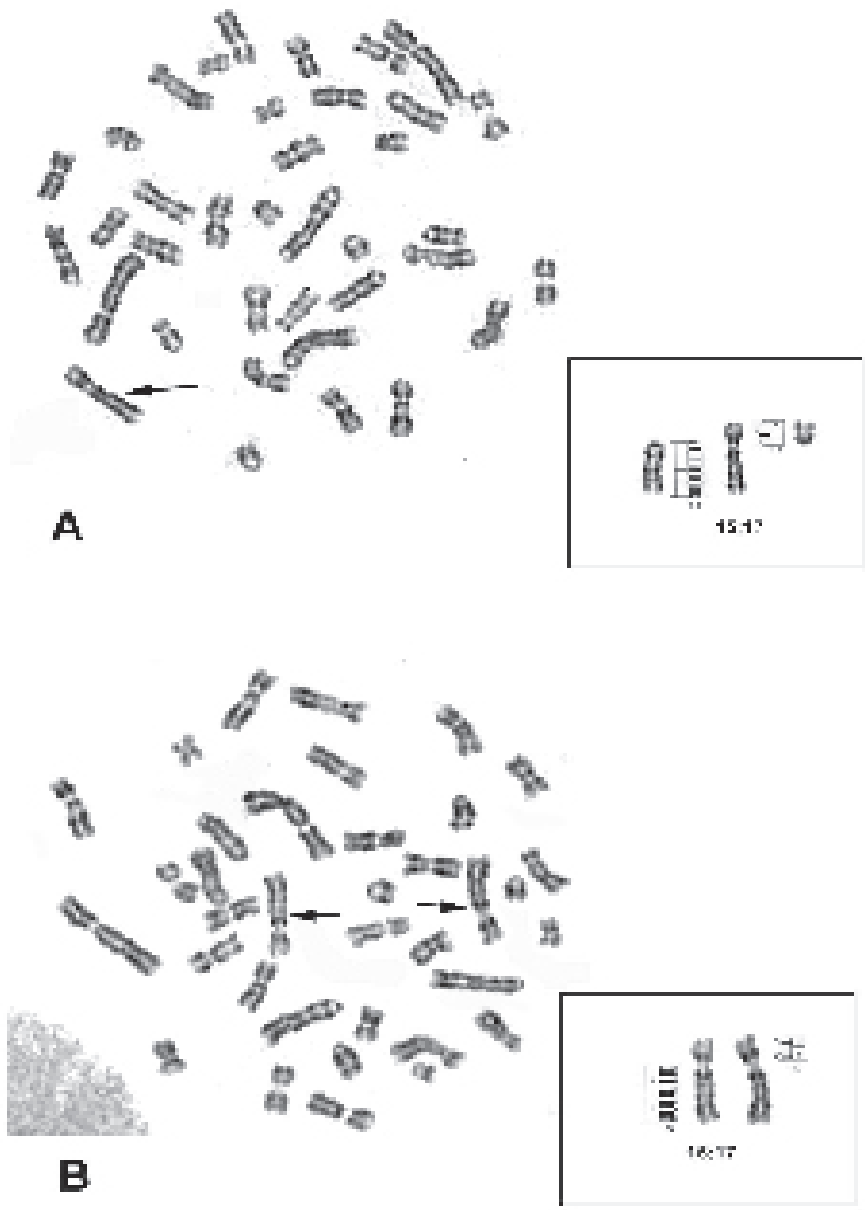

Fig. 1. GTG-banding technique – metaphase plates: A – heterozygotic form of Robertsonian translocation 15;17, B – homozygotic form of Robertsonian translocation 15;17.

in Yugoslavia all investigated animals showed chromosome number 2n = 38 [Zivkovic *et al*. 1971]. The different chromosome number caused by Robertsonian translocation in several different populations of wild boar is a typical example of biodiversity in the *Sus scrofa scrofa* genus.

It is well known that Robertsonian translocation in cattle causes a lower fertility due to early death of embryos with aneuploidy. In the case of crossing domestic pigs with wild boars as performed in special farms in Poland the cytogenetic diagnosis is important for preventing possible reduction in the number of piglets per litter, when the parents are Robertsonian translocation carriers.

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Polimorfizm liczby chromosomów dzików z jednego miotu

S t r e s z c z e n i e

U dzików europejskich (Sus scrofa scrofa) obserwuje się często zjawisko polimorfizmu liczby chromosomów. Związane jest ono z występowaniem w kariotypie zmian w postaci fuzji centrycznych, co wyraża się obecnością w populacji zwierząt trzech różnych liczb diploidalnych chromosomów: 2n = 36, 2n = 37 i 2n = 38. Celem podjętych badań była analiza kariotypu pięciu dzików pochodzących z jednego miotu (dwie loszki i trzy knurki), po nieznanych rodzicach. Zastosowano technikę GTG. Kariotyp jednego knurka okazał się prawidłowy (38,XY), dwie loszki (37,XX,t.rob15;17) i jeden knurek (37,XY,t.rob15;17) były heterozygotami, a jeden knurek (37,XX,t.rob15;17) był homozygotycznym nosicielem translokacji, w której uczestniczyły chromosomy 15 i 17. Uzyskane wyniki wykazały obecność w badanym miocie polimorficznych form kariotypowych. Stwierdzono również segregację translokacji 15;17 zgodną z prawami Mendla (rozkład 1 : 2 : 1), co znaczy, że rodzice badanych zwierząt byli heterozygotycznymi nosicielami translokacji Robertsona 15;17.