



Cytogenetic investigation in two endangered pig breeds raised in Southern-Italy: Clinical and environmental aspects



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ABSTRACT

Representative groups of animals of two endangered local pig breeds (Casertana and Nero Siciliano, both with black skin and raised in Southern-Italy) were cytogenetically investigated and compared to check for the presence of chromosomal abnormalities and to test their chromosome stability by sister chromatid exchange (SCE) test, in their normal breeding conditions. Forty-two Casertana pigs (22 males and 20 females, raised in 3 farms) and 39 Nero Siciliano pigs (19 males and 20 female, raised in 3 farms) were investigated. All animals showed normal CBA- and RBA-banded karyotypes ($2n = 38$), except for two Nero Siciliano boars (both from the same farm) which showed $2n = 37$ being heterozygous carrier of rob (15;17). The translocation was confirmed by FISH-mapping with specific BAC-clones. Both animals were probably hybrids from crosses with the wild pig ($2n = 36$) present in the Nebrodi mountains where Nero Siciliano is reared with extensive or semi-extensive systems. SCE-test applied on all studied animals revealed no statistical differences between the SCE-mean number of Casertana (7.13 ± 3.20) and Nero Siciliano (6.87 ± 3.12) breeds. Statistical differences were found between SCEs mean values of males (7.26 ± 3.38) and females (6.59 ± 2.90) of Nero Siciliano breed, as well as between females of Casertana (7.24 ± 3.26) and Nero Siciliano (6.59 ± 2.90) breeds, while no statistical differences were found between SCE mean values of males of Casertana (6.98 ± 3.10) and Nero Siciliano (6.45 ± 2.97) breeds, as well as between males and females of Casertana breed.

1. Introduction

Casertana and Nero Siciliano pigs are two endangered breeds (both with black skin) raised in the Southern of Italy. The Casertana pig breed (Fig. 1A) is raised in Campania region, mainly in Caserta province. In 2017 the Birth Register maintained by the National Swine Breeders Association (ANAS) recorded a total of 706 pigs (137 sows, 31 boars and 538 young animals) in 21 farms located mainly in Caserta province. It's a very rustic breed, suitable for wild or half-wild farming with fattening trend. The colour of skin is black or slate-grey. Its meat is particularly suited for processing or direct consumption.

The Nero Siciliano pig breed (Fig. 1B) is today farmed with extensive or semi-extensive systems in the Nebrodi mountains, Sicily (Guastella et al., 2010). Known locally as the "suino nero dei Nebrodi",

it has a prominent ridge of spinal bristles running from its large head to about midway along its back and stands about 70 cm high. In 2017 the Birth Register maintained by ANAS recorded a total of 5,842 pigs (624 sows, 69 boars and 5,149 young animals). The swines are allowed to graze and forage over wide areas, including woods, and this diet influences the meat's flavor.

Crosses between domestic ($2n = 38$) and wild ($2n = 36$) pigs are possible and the hybrids (fertile) have $2n = 37$, being two acrocentric chromosomes of domestic pig (15 and 17) fused in the wild pig by a centric fusion translocation (Bosma, 1976; Sysa et al., 1984; Arroyo-Nombela et al., 1990). Chromosome stability ensures that genetic information is correctly transmitted during the DNA replication, cell proliferation and specie generations. Several studies report a variable rate of genome stability (or instability) by using sister chromatid

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Fig. 1. Casertana (A) and Nero Siciliano (B) breeds.

exchange (SCE) test according to the species analysed, like cattle (Di Berardino and Shofner, 1979; Iannuzzi et al., 1990; Iannuzzi et al., 1991; Ciotola et al., 2005; Di Meo et al., 2011; Perucatti et al., 2016; Rangel-Figueiredo et al., 1995) river buffalo (Iannuzzi et al., 1988; Genuardo et al., 2012; Iannuzzi et al., 2016), sheep (Di Meo et al., 2000; Iannuzzi et al., 2004; Perucatti et al., 2006; Genuardo et al., 2015), goat (Di Meo et al., 1993; Lopez and Arruga, 1992; Wojcik and Smalec, 2012) and pig (Rubes, 1987; Peretti et al., 2006; Ciotola et al., 2014), while only few data are available about the genome stability variation in different breeds of the same species. found statically different mean values of SCE/cell between Podolian and Friesian cattle breeds reared under similar conditions including diet, sex (all males) and age. Indeed, SCE-test may be influenced by the by technical conditions of cellular growth, BrdU-doses, sex, age, dietary habits and genes (Carrano et al., 1980; Latt et al., 1981; Waksvik et al., 1981; Soper et al., 1984; Wulf et al., 1986). No direct cytogenetic comparisons between these two

endangered pig breeds have been performed so far. SCE-test has been largely applied to test chromosome stability in cells of animals naturally or *in vitro* exposed to mutagens. The number of SCEs in the cells of single animal or of animal groups is higher than the normal, showing higher chromosome fragility with increasing probability to get genetic mutations and/or chromosome aberrations.

In this study, representative groups of animals of two endangered pig breeds were, cytogenetically analysed and compared by using both CBA- and RBA-banding techniques, as well as the SCE-test to check for the presence of chromosomal abnormalities and their chromosome stability under their normal breeding and environmental conditions, respectively.

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