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Short Communication

Genetic health in the Czech cattle population

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The paper sums up the studies done in the cattle population in the Czech Republic, concerning the genetic health. As for the congenital defects, umbilical hernia was the most frequently noted disorder. In the 90´s, BLAD became a serious problem in the Czech cattle population. However, strict measures have been efficient, and the frequency of heterozygous sires decreased rapidly. The approach to CVM was not consistent enough, and therefore the decrease was somewhat slow. The recessive alleles of bovine citrullinaemia, DUMPS, glycogen storage disease V and II, and factor XI deficiency were not found. Further, the cytogenetic analysis was done. Robertsonian tranclocation affected 0.50% of Czech Simmentals, and 3.57% of beef sires, the Holsteins were not affected. Autosomal aneuploidies were not found, and 2.3% beef animals carried gonosomal triploidy.

Keywords: congenital, CVM, BLAD, chromosomal abnormalities, translocation

1 Introduction

Genetic health is rather intricate matter, and needs consequent continuous attention in breeding. Congenital disorders do not occur often. They have been subject to analysis by many authors (Herzog, 1992; Agerholm et al., 1993; Saperstein, 1993; Toombs et al., 1994; Wikse et al., 1994; Healy, 1996; Grubbs and Olchowy, 1997; Kuhn, 1997; Čítek et al., 2004; 2006; 2009a).

In the 90´s, BLAD become a serious problem of the Holstein population worldwide, and CVM in the 21st century. They are recessive disorders, disseminated by extensive use of heterozygous sire (Čítek and Bláhová, 2004).

Aneuploidies and chimerism also can occur more or less frequently. Ducos et al. (2008) published a survey of the cytogenetic screening of livestock populations in Europe. Developments in omics technologies may help overcome some limitations of traditional breeding programmes (Berry et al., 2011), but databases of phenotypes will be still necessary.The paper sums up the studies done in the Czech cattle population, and focuses on the various aspects of the genetic health.

2 Material and methods

In the Czech Republic, a surveillance programme was established to check the genetic health of cattle. Field veterinarians reported the birth of disabled calves, noted their diagnosis, and identified the sire and the dam.

The recessive hereditary disorders BLAD and CVM were diagnosed by molecular analysis. In total, 1238 males and 159 females for BLAD, 310 males and 49 females for CVM were tested. Similarly, bovine citrullinaemia, DUMPS, glycogen storage disease V and II, and factor XI deficiency were diagnosed at the gene level.

Cytogenetic analyses of lymphocytes were used to identify chromosomal abnormalities, XX/XY chimerism, aneuploidy and centric fusions were detected. A total of 2,425 animals were examined.

3 Results and discussion

3.1 Congenital defects

Only 18 congenital disorders occurred in the progeny of 10 and more sires, that is hernia umbilical, BLAD, opened hock, contracture of muscles, schistosomus reflexus, stillborn, hydrocephalus, unviable calves, Robertsonian translocation, brachygnathias, atresia ani, ascites, perishing of calves, abortion, paresis, hernia cerebralis, dystocia (Čítek et al., 2009a). A further 12 disorders affected the progeny of 5 to 9 sires, the remainder of the congenital disorders identified, 80% of 151 described disorders were in the progeny of 4 and fewer sires; 88 disorders in the progeny of 1 sire. Of individual defects, umbilical hernia occurred most frequently. Different defects of limbs were frequent, namely opened hock, and contractures of muscles and ligaments. Male genitals were affected only rarely, cryptorchidism appeared only once. In total, 8.6% of Holstein sires and 6.5% of Czech Simmental sires have born the offspring with congenital

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disorder. Pedigree of sires fathering schistosoma reflexus calves was analysed, and the defect was confirmed to be heritable (Citek, 2012).

3.2 Recessively inherited diseases

In the 90´s, the occurrence of BLAD heterozygous animals in Czech Holsteins was 13% (Čítek et al., 2008a). The strict measures have been efficient, as the frequency of positive sires decreased rapidly below 1% and current findings are rare. However, continuous control is necessary. As for CVM, in the Czech Holstein population has been recorded the frequency of 20% in 2001. Restrictive measures have been undertaken too, but the use of CV heterozygous sires was not totally banned. The frequency decreased, but persisted still considerably, almost 15% in 2005–2011. Nowadays, the CV sires are not used usually. The analyses of bovine citrulinaemia, DUMPS, glycogen storage disease V and II and factor XI deficiency did not revealed the recessive alleles (Čítek et al., 2007; 2008b).

3.3 Chromosomal abnormalities

The XX/XY chimerism was found in 0.50% of Holstein and in 0.74% of Czech Simmental sires (Čítek et al., 2009b). In testing for aneuploidies, 1.79% Charolais sires and 4.17% heifers were carriers of a redundant sex chromosome (61,XXY; 61,XXX). Autosomal aneuploidies were not found. The search for Robertsonian translocations showed frequency of 0.82% in Czech Simmental sires, of 3.57% in beef sires. Our results are well consistent with other authors, e.g. Seguin et al. (2000), who did not find centric fusion in Holstein sires, but did find chimeric animals.

4 Conclusions

The occurrence of inherited disorders is sporadic, but possible spread causes serious economic losses. Identification on the molecular basis enables the quick recovery of the population. In the Czech Republic, the Simmental and beef breeds should be controlled for the Robertsonian translocations, and the Holsteins for CVM and BLAD.

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