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# The t(1/29) chromosome translocation in *Danish Blonde d'Aquitaine* cattle

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## INTRODUCTION

The bovine population is an excellent material for genetic and biological studies, although it is very often difficult to have access to the material. The very intensive breeding programs in the last two decades have improved the production of milk and beef. Concurrent with this improvement and international exchange of bovine genetic material, the frequency of hereditary diseases has increased. The t(1/29) chromosome translocation was diagnosed in the *Danish Blonde d'Aquitaine* cattle (BAQ) by Hansen (1989), and Nielsen and Kristensen (1989). The present paper describes a cytogenetic investigation of most of the Danish BAQ population.

## MATERIALS AND METHODS

BAQ animals imported with certificates and their purebred offspring in 13 herds, several bred by the embryo transplantation technique, were examined cytogenetically, and many clinically too. Some crossbred calves were examined outside the program. All females and bulls examined belong to the farmers who take part in this research program. We were not allowed to examine the BAQ AI bulls. Blood samples were drawn into Venoject 10 ml vacutainers from the jugular or the tail and stabilized with sodium heparin. The lymphocytes were cultivated for 72 h, according to the method described by Hansen (1972). Analyses of the chromosome modal number were carried out on conventional Giemsa-stained slides. The QFQ, GTG and RBA methods as described previously by Hansen (1977) were used for identification as soon as minor deviations of the pro- or metaphase plates were observed. Chromosomes were numbered according to the 1976 Reading Conference (1980) (fig 1).

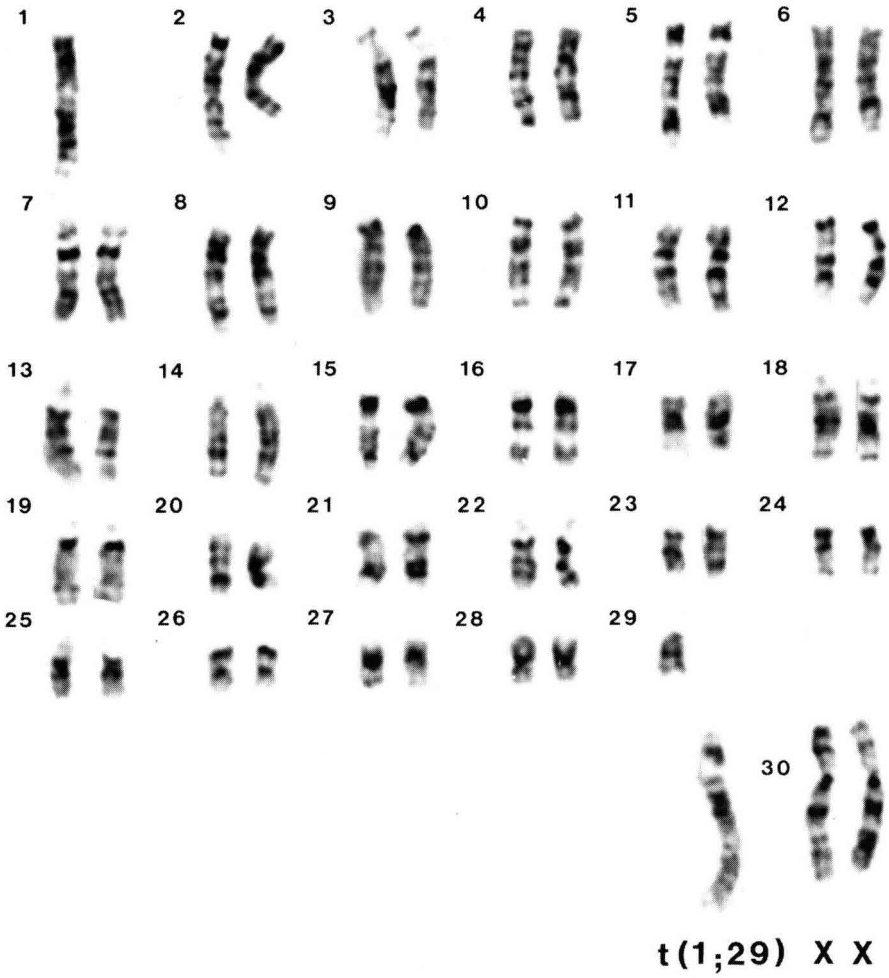


**Fig 1.** GTG-band karyotype of a *Danish Blonde d'Aquitaine* female with a t(1/29) Robertsonian translocation.

## RESULTS

The centric fusion translocation t(1/29) was diagnosed in purebred as well as in crossbred animals, and in several generations. Both sexes were affected. Because of the difference in the numbers of females and bulls in the herds, more female than male carriers were diagnosed. The total number of BAQ animals examined in February 1990 was 228 (see table I). Of these, 114 females (50.0%) and 31 males (14.0%) were free of the t(1/29) translocation. 54 females (23.7%) and 23 males (10.0%) were heterozygous and two females were homozygous (0.9%) for the translocation. Furthermore, one pair of chimeric female/male twins without t(1/29) (0.4%), and one cytogenetically normal calf (0.4%), twin to a dead t(1/29) carrier

bull calf, were diagnosed. A possible new chromosome translocation was identified in one animal (0.4%). Of 12 private bulls (sires) examined, 4 were heterozygous, see table II. The chromosome status of two AI sires born in France was deduced from offspring analysis: Ukrainien (herdbook no 68001) was heterozygous and Agenais (herdbook no 68005) was in all probability homozygous. All animals affected by t(1/29) were clinically and phenotypically normal.

**Table I.** Chromosome status of the *Danish Blonde d'Aquitaine* population examined.

| *Total no and %* | *Free from t(1/29)* | | *Hetero-zygous* | | *Homo-zygous* | | *Chimerism normal* | | *Chimerism t(1/29)* | | *Possible new translocation* |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | *F* | *M* | *F* | *M* | *F* | *M* | *F* | *M* | *F* | *M* | |
| 228 | 114 | 31 | 54 | 23 | 2 | 0 | 1 | 1 | 0 | 1 | 1 |
| % | 50.0 | 14.0 | 23.7 | 10.0 | 0.9 | 0 | 0.4 | 0.4 | 0 | 0.4 | 0.4 |

F: females; M: males.

**Table II.** Chromosome status of *Danish Blonde d'Aquitaine* sires.

| *Ownership* | *No examined* | *Free from t(1/29)* | *Heterozygous* | *Homozygous* | *% affected by t(1/29)* |
|---|---|---|---|---|---|
| Private | 12 | 8 | 4 | 0 | 33.3 |
| AI stations* | 2 | 0 | 1 | 1 | – |

* See text.

## DISCUSSION AND CONCLUSION

Hereditary-negative traits may be watched over more carefully, not only by the cattle breeding societies, but also by specialized state laboratories, which may use the material for research purposes. In the last decade, Denmark has imported the RVC syndrome to the *Jersey* breed (Hansen, 1985), and the Weaver and the recumbent calf syndrome to the *Red Danish Milkbreed* (Hansen, 1984, 1988). The t(1/29) chromosome translocation in the Danish BAQ was imported from France by BAQ individuals. As the BAQ sires have been used for beef production, this translocation may also occur in Danish crossbreeds in the future. Darré *et al* (1972) found about 20% of the French BAQ AI sires affected by t(1/29). This frequency is difficult to compare with the frequency of the Danish material, but 33.3% of the Danish private BAQ sires were heterozygous. Of two AI sires diagnosed by the chromosome status of their offspring, one was heterozygous and the other was homozygous for the translocation. Cribiu and Popescu (1980) observed a frequency of 24.7% in the French BAQ population, which is very similar to that of the Danish BAQ females, 24.6%. The first description of the t(1/29) in French

BAQ was given by Darré *et al* (1972). Later, Darré *et al* (1974) described a possible t(7/20) translocation, which was recently identified as a (9/23) by Cribiu *et al* (1989). Berland *et al* (1988) described a t(21/27) translocation. Bruère and Chapman (1973) described the t(1/29) translocation in BAQ in New Zealand. It may be concluded that the t(1/29) chromosome translocation is as frequent in the Danish BAQ breed as in the French BAQ population. However, this translocation is not a major problem in Denmark today because the Danish BAQ farmers, who collaborate with our laboratory, systematically eradicate the t(1/29) translocation from their herds.

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