

## ABSENCE OF 1/29 TRANSLOCATION IN ABERDEEN ANGUS BREED

JC De Luca<sup>1</sup>, P Sister<sup>1</sup>, A Prando<sup>2</sup>, A Baldo<sup>2</sup>, G. Giovambattista<sup>1</sup>

<sup>1</sup> Centro de Investigaciones en Genética Básica y Aplicada (CIGEBA).

<sup>2</sup> Cátedra de Zootecnia Especial parte 2

Facultad de Ciencias Veterinarias, Universidad Nacional de La Plata.

**ABSTRACT:** Robertsonian translocations are the most frequent chromosomal aberrations in cattle. The first robertsonian translocation described was the 1/29 translocation. Like other centric fusions, this abnormality reduces fertility as a consequence of genetic excess or deficiency in the germ cells, increasing early embryonic mortality. The incidence of 1/29 translocation in 89 Aberdeen Angus cattle (38 dams and 51 sires) belonging to 4 farms of the Buenos Aires Province was analyzed, as well as the Y chromosome morphology. Heparinized blood samples were obtained and cultured for cytogenetic analysis. The results obtained showed the absence of the 1/29 translocation in all the animals studied. In all the bulls analyzed Y chromosome morphology was submetacentric. The results obtained in the present work are in concordance with previously results reported for the British beef breeds, like Aberdeen Angus. On the other hand the animals studied did not show fertility reduction, then this could be associated with the absence of the 1/29 translocation. Further studies are needed to assess the entire breed.

**Key words:** 1/29 translocation, bovine, Aberdeen Angus

## AUSENCIA DE LA TRANSLOCACIÓN 1/29 EN BOVINOS ABERDEEN ANGUS

**RESUMEN:** Las translocaciones robertsonianas son las translocaciones más frecuentes en el ganado bovino. La primera translocación robertsoniana descrita en el Ganado bovino fue la 1/29. Al igual que otras fusiones céntricas esta alteración reduce la fertilidad de los animales portadores, ya que se originan gametas genéticamente desbalanceadas, provocando un aumento de la mortalidad embrionaria temprana. Se evaluó la incidencia de la translocación 1/29 en 89 bovinos Aberdeen Angus (38 hembras y 51 machos) pertenecientes a 4 establecimientos de la Provincia de Buenos Aires. Se obtuvieron muestras de sangre heparinizadas, las que se cultivaron para su posterior análisis citogenético. El análisis citogenético reveló la ausencia de esta translocación en todos los animales estudiados. En el caso de los machos la morfología del cromosoma Y fue de tipo submetacéntrico. Los resultados obtenidos concuerdan con los reportados para razas carniceras británicas. Por otra parte, los animales estudiados no mostraron una disminución de la fertilidad, lo cual podría estar asociado con la ausencia de la translocación 1/29. Una ampliación de estos estudios sería necesaria para acceder a un mayor conocimiento del estado de esta alteración en esta raza.

**Palabras claves:** Translocación 1/29; Bovino; Aberdeen Angus.

Fecha de recepción: 03/07/07

Fecha de aprobación: 03/10/07

---

**Dirección para correspondencia:** JC De Luca, Centro de Investigaciones en Genética Básica y Aplicada (CIGEBA). Facultad de Ciencias Veterinarias. Universidad Nacional de La Plata. CC 296, (B1900AVW) La Plata, Argentina. **E-mail:** [jdeluca@fcv.unlp.edu.ar](mailto:jdeluca@fcv.unlp.edu.ar)

---

## INTRODUCTION

Robertsonian translocations are the most common chromosomal abnormalities in cattle. They result from breakage and subsequent fusion of the centromeric regions of two acrocentric chromosomes. They are widespread, affecting different breeds of cattle [1]; more than 25 different types of centric fusion have been identified so far. The first robertsonian translocation described was the 1/29 translocation [2]. This chromosomal aberration has been reported in more than 50 breeds, and is the most frequent chromosomal aberration in cattle [3]; [4]. The translocation is rapidly disseminated by artificial insemination due to the lack of its effect on the phenotype. Like other centric fusions, this abnormality reduces fertility as a consequence of genetic excess or deficiency in the germ cells, increasing early embryonic mortality [5], [6]. This fertility reduction can be explained through an increase early embryonic mortality, due to karyotypes lethality obtained from unbalanced gametes [7]. This has been confirmed, because no alive individuals with monosomic or trisomic karyotypes have not been found [8]; [9]. Most of their carriers are translocation heterozygotes [10]. However, some types of centric fusion are not so widespread and their role in reproduction has not been fully elucidated yet. For instance, it has been described that a slight reduction in fertility is associated with rob(1;29). The present was focused on the analysis of the incidence of chromosomal abnormalities, mainly the 1/29 translocation, in Aberdeen Angus cattle belonging to different farms of Buenos Aires Province Argentina.

## MATERIAL AND METHODS

Cytogenetic analysis was carried out on 89 phenotypically normal Aberdeen Angus, belonging to 4 farms in the Buenos Aires Province, Argentina. Heparinized peripheral blood samples were obtained from jugular vein and then cultured 72 hours in Ham's F12 culture medium, supplemented with Pockeweet (GIBCO, BRL, Githersburg, MD, USA at concentrations recommended by the suppliers), penicillin (60 IU) and streptomycin (50 µ/ml). Two hours before harvesting, cells were incubated with colchicine (1 µ/ml). After centrifugation, the lymphocyte cells were resuspended in 5 ml of Potassium Chloride 0.075 N and incubated at 37 °C for 30 min. Fixation was carried out with methanol-acetic acid (3:1)

at room temperature. Chromosomal preparations were made by dropping the cell suspension onto cold slides that were stained with 5% Giemsa solution. Thirty metaphases per animal were scored to check the incidence of 1/29 translocations.

## RESULTS

Table 1 showed the results obtained from cytogenetic analysis. All the metaphases showed  $2n=60$  chromosomes and not a single 1/29 translocation was found. As expected, all bulls showed a submetacentric Y chromosome.

## DISCUSSION

In the present work, the incidence of 1/29 translocation in Aberdeen Angus breed was analyzed. This translocation has been studied in several breeds from all continents, being reported in more than 50 breeds [11]. However, the incidence of this translocation varied significantly according to bovine breeds and groups of breeds. High frequency has been reported in Portuguese and Spanish breeds, in British White cattle, in Swedish Red and White cattle, in Italian breeds, in Continental breeds and *Bos taurus* from Africa and Asia cattle breeds [12]; [5]; [13]; [14]. In contrast, it has been well documented that the most of the British beef breeds do not show the translocation [14]; [15]. The results obtained in the present work are in concordance with previously results reported for the British beef breeds, like Aberdeen Angus.

## ACKNOWLEDGMENTS

This work was supported by grants from the Japan International Cooperation Agency, the Universidad Nacional de La Plata, the CONICET and the CIC.

## REFERENCES

- Popescu CP. From chromosome shape to chromosome mapping: 30 years of domestic animal cytogenetics. *Archivos de Zootecnia* 1996; 45 : 117-24.
- Gustavsson I, Rockborn G. Chromosome abnormality in three cases of lymphatic leukaemia in cattle. *Nature* 1964; 203: 990
- Tambasco AJ, Trovo JBF, Barboza PF. Estudo cromossômico de raças naturalizadas de bovinos. XXII Cong "Sociedade Brasileira de Zootecnia". (1985); Camboriu. Abstract.

Table 1: Incidence of 1/29 translocation

Breed	Location	Animals	N° of dam studied	N° of sires	Cells Scored	Carriers translocations
Aberdeen Angus	1	7	7	0	210	0
Aberdeen Angus	2	18	18	0	540	0
Aberdeen Angus	3	40	0	40	1200	0
Aberdeen Angus	4	24	13	11	720	0
Total		89	38	51	2670	0

4. Postiglioni A, Llambi S, Gagliardi R, De Betheencourt M.. Genetic characterization of Uruguayan Creole cattle. *Archivos de Zootecnia* 1996; 45: 209-213.
5. Gustavsson I. Cytogenetics distribution and phenotypic effects of a translocation in Swedish cattle. *Hereditas* 1969; 63 : 68-169.
6. De Luca JC, Zufriategui L, Ripoli MV, Giovambattista G, Dulout FN. "Cytogenetic study of "Saavedreño" Creole cattle". *Cytologia* 2000; 65: 7-11.
7. Popescu CP. Chromosome of the cow and bull. In: *Domestic animals cytogenetics*. Editor: Richard McFely. Academic Press – USA. 1990; 41-71.
8. Popescu PC. Cytogenetic study on embryos sired by a bull carrier 1/29 translocation. 4th Eur Colloq Cytogenet Domestic Animals. Uppsala, Sweden. 1980; 182-186.
9. King WA, Linares T, Gustavsson I. Cytogenetics of preimplantation embryos sired by bulls heterozygous for the 1/29 translocation. *Hereditas* 1981; 94 : 219-224.
10. De Luca JC, Zufriategui L, Picco SJ, Ripoli MV, Giovambattista G, Rojas FV, Dulout FN. "Incidence of 1/29 translocation in Bolivian Creole cattle and Brahman yacumeño". *Theriogenology* 2002; 58: 1273-1281.
11. Popescu CP. The 1/29 translocation 20 years after. In: *Proceedings of the 6th European Colloquium of Cytogenetic of Domestic Animals*. Zurich. 1984; 36-39.
12. Arruga, MV, Zaragosa Y. "La translocación robertsoniana 1/29 en el ganado vacuno. Su incidencia en las razas vacunas españolas". *Genét Iber* 1987; 39 : 61-75.
13. Succi G, Molteni L, Giovannni A. Cytogenetic study of some Italian cattle breeds in decreasing or in way of extinction. In *Proceedings of the 4th European Colloquium of Cytogenetic of Domestic Animals*. Uppsala, Sweden. 1980; 136-140
14. Moreno-Millán M, Rodero Franganillo A, Ocaña Quero J. Evolución de la incidencia de la translocación 1/29 en la raza vacuna retinta en los últimos seis años. *Archivos de Zootecnia* 1995; 44 : 137-138.
15. Seguin BE, Zhang TQ, Lance CB, Alvin FW, Ruth GR. Cytogenetic survey of Holstein bulls at a commercial artificial insemination company to determine prevalence of bulls with centric fusion and chimeric anomalies. *Journal of American Veterinary Medical Association* 2000; 216 : 65-67.