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Note

Robertsonian translocation in a *Chianina* cow and in its offspring (1)

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Summary

Cytogenetic examination was performed on a thirteen year old *Chianina* cow which had normal fertility and above average frequency of twin births ; the same examination was performed on its offspring. Structural chromosome abnormalities were found in the mitotic cells analyzed.

The aberrations, including the 1/29 translocation, were found in the cow as well as in both sexes of its twin calves which also showed leukocytic chimerism 59XX/59XY.

Cytogenetic studies are assuming great importance in studies of subfertility and infertility in animal species of zootechnic interest, particularly cattle and swine.

Frequently, cattle with alterations in reproductive functions show a high incidence of structural abnormalities of an autosome or X-chromosome (HALNAN, 1972 ; EL-NAHASS *et al.*, 1974 ; BONGSO & BASRUR, 1976) or a combination of both.

According to EL-NAHASS *et al.* (1976) these abnormalities are less common in A.I. bulls and breeding cows than in slaughter cattle. Recently HANADA & MURAMATSU (1980) demonstrated a high frequency of structural abnormalities of X-chromosome in a *Japanese Black* cow with low fertility.

In autochthonous Italian bovine breeds, SUCCI *et al.* (1976) found, contrary to reports by EL-NAHASS, a high frequency of translocations in bulls of those breeds that also have the highest incidence of sub-fertility, such as the Romagnola breed. Since the bovine *Chianina* breed has also problems of fertility as a result of long post-partum and calving intervals (about 14-16 months), we took a great interest in

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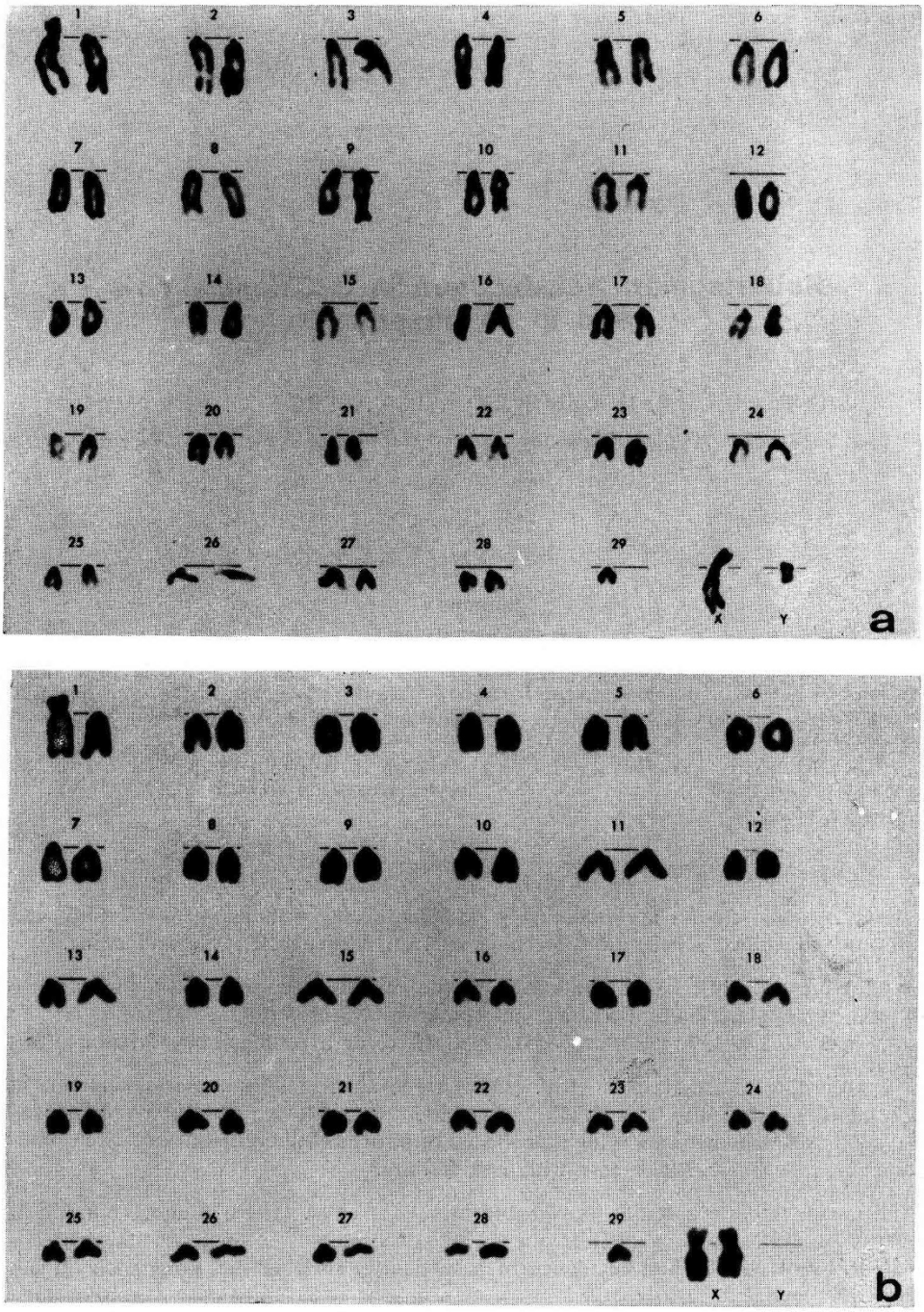

FIG. 1

Karyotype of the male calf with 1/29 translocation
Caryotype du veau mâle avec la translocation 1/29

a) 59XY.
b) 59XX.

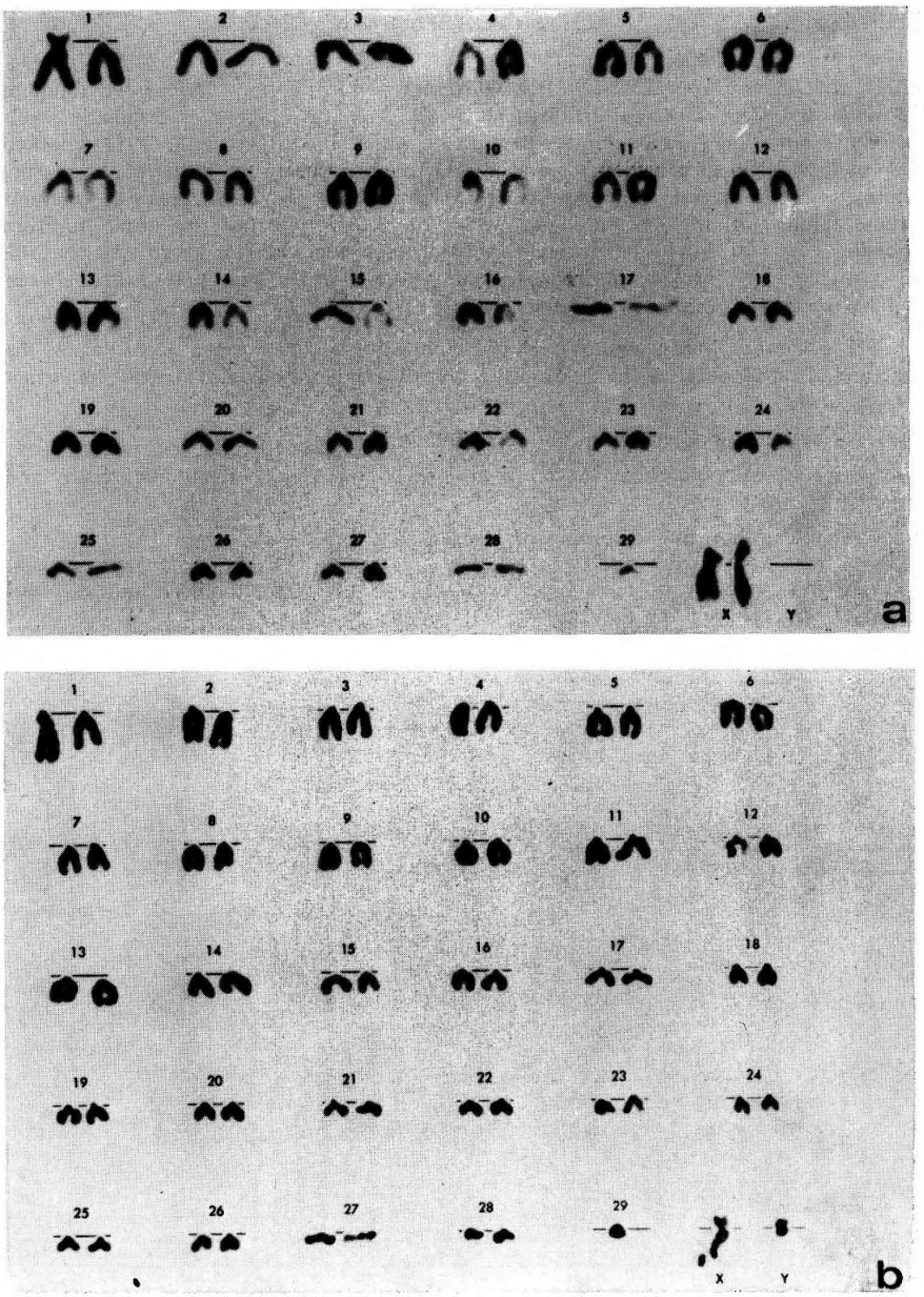

FIG. 2

Karyotype of the female calf with 1/29 translocation
Caryotype du veau femelle avec la translocation 1/29

a) 59XX.
b) 59XY.

this problem and approached it from different points of view. Indeed we found a positive and significant correlation (CASCIOTTI *et al.*, 1980) between haematic levels of Cu++ and $PGF_{2\alpha}$ in a subfertile cow. In the same breed BOITI *et al.* (1981) checked the endocrinological behaviour of the post-partum, measuring the levels of the plasma hormones. On several subjects of the Chianina breed we are screening structural abnormalities of the chromosomes with the karyotypic test in order to find possible correlations with hormones involved in reproduction. This karyotypic research is also meant to provide informations on the relationship that may exist between environment and chromosomal aberrations.

The karyotypic test employs cellular cultures and is performed according to the method of DE GROUCHY *et al.* (1964) using whole peripheral blood. The most important stages are :

— careful blood drawing and sedimentation ;

— culture preparation, arrest of mitoses by colcemid, hypotonic shock and fixation ;

— preparation and colouring of smears.

A great number of metaphases for each subject was examined and the best samples were chosen for the karyotypic test.

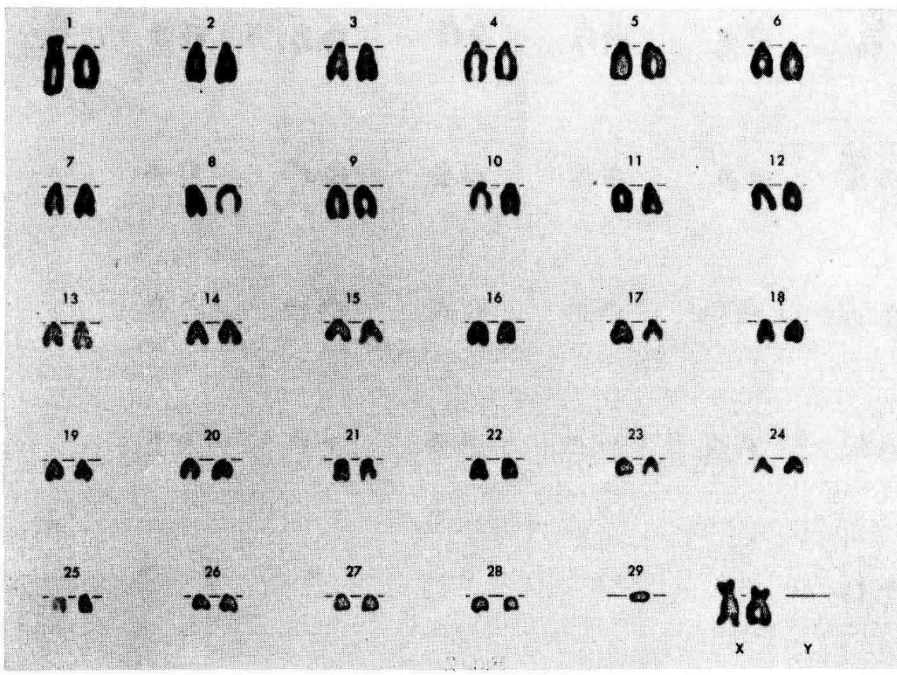

FIG. 3

Karyotype of the Chianina *cow with 1/29 translocation*
Caryotype de la vache Chianine *avec la translocation 1/29*

For the necessary comparisons, female subjects with normal reproductive cycles were compared to others with long calving intervals.

In the group of normal fertility subjects used as a control, a Chianina cow attracted our attention. It was a 13 year old animal with normal fertility, not selected and characterized by an abnormal frequency of twin-births and always with living and viable offspring. During the observation, the cow was six months pregnant and also had the twin calves from its last birth, a male and a female. These animals underwent karyotypic test as well. It should be noted that all three had no particular phenotypical manifestations.

Karyotypic test of the 3 subjects (see pictures no. 1, 2, 3) revealed the following :

a) the cow :

— 1/29 translocation ;

b) the twin calves :

— the same 1/29 translocation as in the cow was present in both ;

— true presence of leukocytic chimerism and a chromosomal make up, 59XX/59XY, in both calves.

The chromosomal abnormality is conspicuous in the cow as well as in both sexes of the calves of the last twin birth. Translocation, however, did not cause the cow any fertility disorder. For this reason no conclusion can be drawn. Hormonal research on calves is presently being carried out and the course of the cow's pregnancy will continue to be supervised and its future offspring examined.

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Résumé

Translocation robertsonienne chez une vache Chianine *et sa descendance*

Une étude cytogénétique a été réalisée chez une vache appartenant à la race *Chianine* de treize ans. Elle montre une fertilité normale, n'est pas sélectionnée et elle est caractérisée par une certaine fréquence de mises bas gémellaires.

On a fait la même étude cytogénétique chez deux jumeaux, de sexes différents, que la vache avait eu dans la dernière mise en bas. Aussi bien la vache que les jumeaux sont phénotypiquement normaux. Chez la vache on a trouvé, dans toutes les cellules étudiées, un nombre de base réduit à 59 et la présence d'un chromosome submétacentrique de type 1/29. Cette translocation toutefois n'a causé aucun désordre de la fertilité. La translocation 1/29, trouvée dans la vache, a été mise en évidence chez les jumeaux aussi ; chez les deux veaux nous avons trouvé, de plus, la présence d'un chimérisme leucocytaire : 59XX, 59XY.

Riassunto

Una translocatione di Robertson in una vacca Chianina

Indagini cariologiche compiute sui bovini di razza *Chianina,* hanno permesso di evidenziare in una vacca di 13 anni età, con una normale fertilità, e in due suoi figli gemelli di sesso diverso alterazioni strutturali cromosomiche.

L'abberrazione comprendente la fusione centrica di due cromosomi (translocazione 1/29) è stata riscontrata sia nella bovina che nei suoi figli che presentavano inoltre il chimerismo leucocitario 59XX/59XY.

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