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A CASE REPORT: MOSAIC DIPLOID/TETRAPLOID IN A PREGNANT COW INFECTED WITH LUMPY SKIN DISEASE

By

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SUMMARY

A phenotypically normal pregnant (2 months) Egyptian cow (Baladi breed) was examined cytogenetically among 10 other cows screened for any cytogenetic abnormality during an epidemic of lumpy skin disease. Cytogenetic analysis revealed a diploid/tetraploid mosaicism in only the case reported cow.

Two cultures were performed with a month interval in between. The first culture revealed a polyploid in 43% of the cells, while the second culture showed only 36% of cells to be polyploid. Blood counts done at the time of the first culture revealed mild lymphocytosis and monocytosis and many lymphocytes showed double nuclei.

Two other cultures done after a 10 months period from the second culture showed a normal karytoype. Moreover the cytogenetical analysis of the newborn calf of this cow showed a normal karytoype constitution.

Most probably the lumpy skin virus "Neethling pox virus" was the cause of these temporary cytogenetic abnormalities.

INTRODUCTION

Polyploids in general are incompatible with vitality of mammals. Few cases of polyploid have been reported in cattle, occurring as a mosaics or chimera. Two cases of mosaic diploid/triploid had been reported in a true hermaphrodite cow by Dunn et al. (1970) and Rieck (1973). A double muscled condition has been reported in cattle by Popescu (1968) as a result of tetra to dekaploid mosaicism. Herzog et al. (1983) described some cases of congenital abnormalities associated with a diploid/tetraploid mosaicism, also in contrast Swartz and Vogt (1983) reported a case of sterile cattle heifer with the same mosaicism.

Lumpy skin disease is a viral highly infectious, eruptive, occasionally fatal disease of cattle characterized by the appearance of nodules on the skin and other parts of the body. Secondary infection often aggravates the condition. It occurs in southern and eastern Africa and in recent years has been extending northeast and northwest through the continent (Blood and Henderson, 1976; Siegmund, 1979).

Blood and Henderson (1976) reviewed the viral causes of the disease. Three strains of the herps virus have been known to cause lumpy skin disease, the Neathling virus is usually the strain

showing the typical humpy skin disease.

MATERIAL AND METHODS

The case used in this study was located at the experimental farm which belongs to the National Research Center, Giza, Egypt. For the cytogenetical analysis blood samples were collected from the case understudy and its calf under aspectic conditions in heparinized vacutainers from the Jugular vein.

Chromosome preparations were obtained according to the standard procedure of whole blood culture. Routine Giemsa stained slides were made for the study of karytoypes. After the appearance of the abnormality, another blood culture was performed one month later. Moreover a blood sample was collected from the calf three weeks after his delivery. Finally two other cultures were done for the case understudy after a 10 months period from the second culture.

For the differential count alaysis, blood samples were collected from both the diseased cow as well as a normal cow under the same conditions.

RESULTS

Cytogenetical analysis of 100 metaphase spreads from the first culture revealed that 43 metaphases were tetraploidy and the rest of the metaphases were diploid (57 metaphase), while in the second experiment we found 36 tetraploid metaphases and 64 metaphases diploid, this difference of the tetraploid cells between the two experiments was not significant when tested using Chi-Square test according to the technique described by Mather (1957). The average percentage of polyploid cells when the two experiments were pooled was 38.5%.

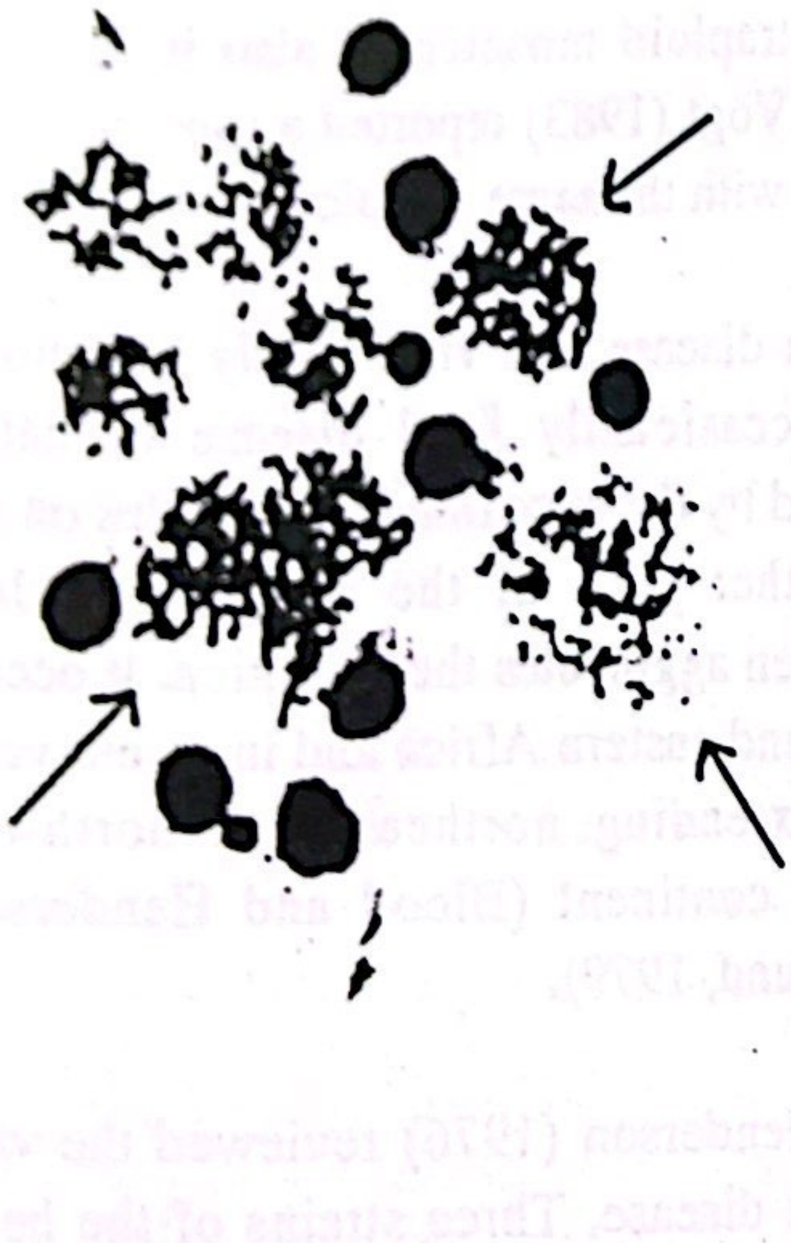
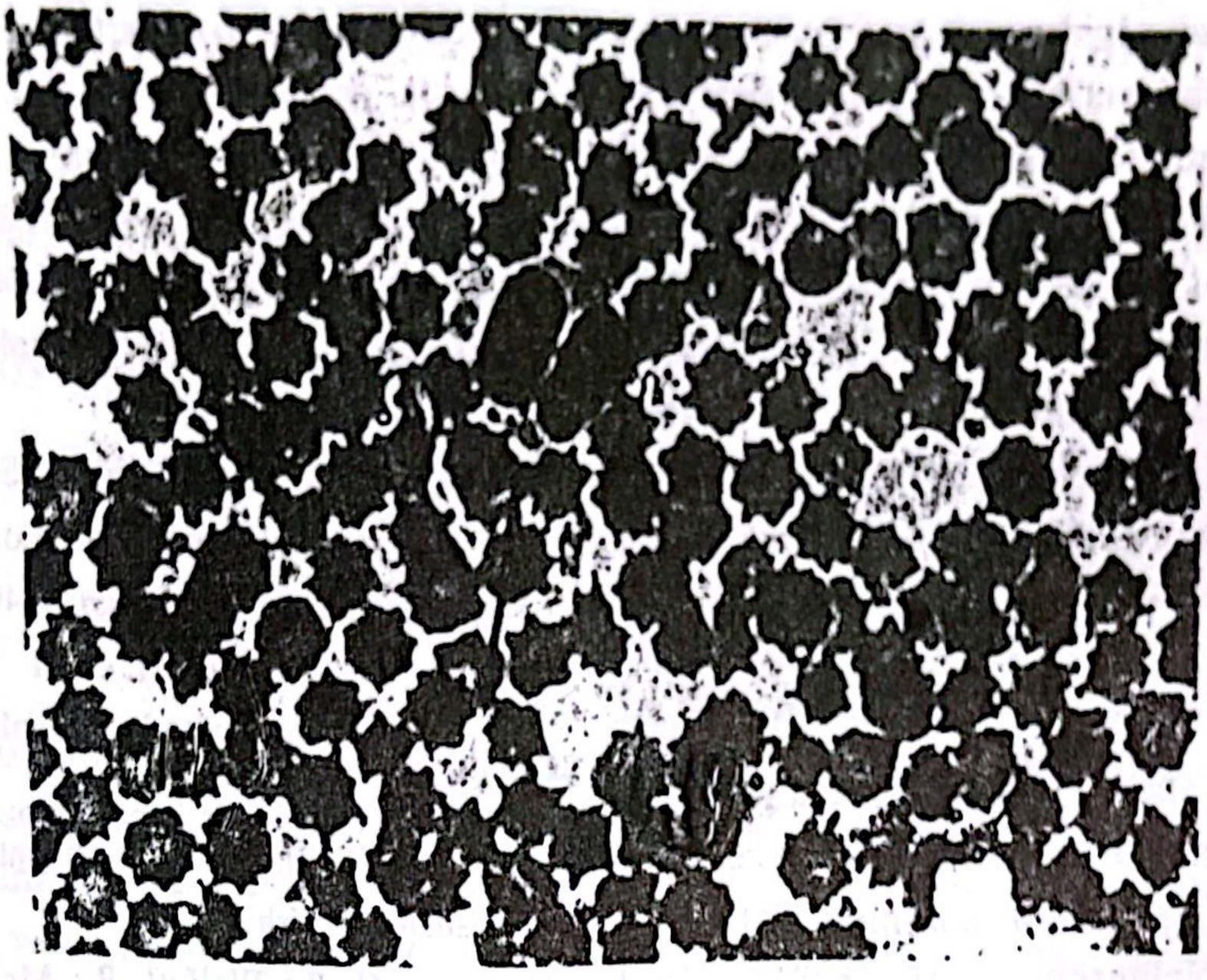


Fig. (1): A microscopic picture of some normal and polyploid metaphase cells photographed with the 10 x magnification

Fig. (2): Two adjacent polyploid metaphase spreads photographed with 100 x magnification.

	Lymphocyte	Neutrophil	Esinophil	Basophil	Monocyte
Diseased cow	71.5 ± 1.39	19.25 ± 0.96	3.5 ± 1.0	2.5 ± 1.0	3.25 ± 0.5
Normal cow	57.67 ± 3.06	35.0 ± 3.46	3.33 ± 0.58	1.67 ± 6.58	2.0 ± 1.0



The cytogenetical analysis of the new born calf of the case understudy and the last two culures for the cow (10 months later after the second culure), all showed a normal karytype constitution.

Concerning the differential white count, it showed an increase in lymphocytes and monocytes in the diseased cow as compared to the normal cow (Table 1). Also we noticed many lymphocytes showing nuclear divisions (binucleated) Fig. 3.

DISCUSSION

According to the published cases of pure polyploidy in humans, it is well known that these cases died before delivery or within a few hours after birth (Graham et al., 1989; Richaradson, 1991).

On the other hand cases of diploid/tetraploid mosaic which have been reported in cattle is usually associated with a problem of fertility (Dunn et al., 1970 and Swartz and Vogt, 1983), or congenital abnormality (Popescu, 1968 and Herzog et al., 1983), that is in contrast with our case because our case is fertile and free from congenital abnormalities.

In our case the average percentage of polyploid cells when the two experiments were pooled was 38.5%, which it is higher than the percentage 3.6, which was reported in the Egyptian Baladi cattle (De Hondt et al., 1988).

It is well known that the appearance of polyploidy in the lymphocyte culture of adults of animals is a sort of chromosome abnormality, such abnormality in lymphocytes means that there is a disease affecting these lymphocytes, in our case the cow was infected with lumpy skin virus which is a blood circulating virus (Blood and Henderson 1976).

Although lumpy skin disease is not a fatal condition yet, both cytogenetic and blood picture revealed gross abnormalities. These abnormalities were in the form of lymphocyte proliferation, polyploidy and nuclear divisions within the lymphocyte which are most probably due to the stimulatory action of the virus on lymphocytes. The virus causing the lumpy skin disease is one of the herpes virus family which has been known to cause lymphocytic proliferation as in the case of infectious mononucleosis (Cheeseman, 1988) and Burkitt's lymphoma (Epstein et al., 1964) in humans which is caused by the EBV (Epstein-Barr Virus) of the herpes virus family.

The EBV binds specifically to surface receptors (the glycoprotein CD 21 that is also the receptor for the (3d componentof complement) on B lymphocytes (Nemerow et al., 1985). Viral binding acts as an initial polyclonal mitogenic stimulus to B cells partly by stimulating expression of a receptor (CD 23) for a B-cell growth factor (Thorley-Lawson, 1988).

In case of infectious mononucleosis the EBV-induced B-cell proliferation which is capable of malignant progression is suppressed by a normal T-cell response (Cheeseman, 1988). This effect is most prbably similar to that occurring in lumpy skin disease in cattle.

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REFERENCES

Blood, D. C. and Henderson, J. A. (1976): Veterinary Medicine (Fourth Edition), Williams and Wilkins publishers. P.551.

Cheeseman, S. H. (1988): Infections mononucleosis. Semin. Hematol, 25: 261.

De Hondt, H. A.; El-Nahass, E. and Fathy, K. (1988): Cytogenetic studies on Egyptian native cattle and some of its crossbreds. J. Anim. Breed. Genet. 105: 400-404.

Dunn, H. O.; McEntee, K. and Hansel, W. (1970): Diploid-triploid chimaerism in a bovine true hermaphrodite. Cytogenetics, 9: 245.

Epstein, M. A.; Achang, B. G. and Barr, Y. H. (1964): Virus particles in cultured lymphoblasts from Burkitt's lymphoma: Lancet 1:702.

Graham, J. M.; Raunsley, E. F. and Simmons, G. M. (1989): Triploidy: Pregnancy complications and clinical findings in seven cases. Prenat Diagn. 9: 409.

Herzog, A..; Hohn, H. and Vainas, E. (1983): Zytogenetische Befunde bei kalbern mit spina bifida, Tieraztl Umschau 38 (4): 259.

Mather, K. (1957): The measurement of linkage in heredity. Mathuen publisher, p. 13.

Nemerow, G. R.; Wolfert, R.; McNaughton, M. E. and Cooper, N. R., (1985): Identification and characterization of the Epstein Barr virus receptor on human B-lymphocytes and its relation to the C3d complement receptor (CR2). j. Virol, 55:347.

Popscu, C. P. (1968): Observation cytogenetiques chez les bovines Charolais normanx et culards. Ann. Genet. 11: 262.

Richardson, A. (1991): Chromosome analysis in the act cytogenetic laboratory manual, Second Edition, edited by M. J. Barch. The Association of Cytogenetic Technologists, published by Raven Press, Ltd. New York. P: 344.

Pieck, G. W. (1973): Numerical aberration of gonosomes and reproductive failure in cattle. Symposium on chromosomal errors in relation to reproductive failure, Paris 1973, 165-187.

Siegmund, O. H. (1979): The MERCK VETERINARY MANUAL (Fifth Edition) P. 246.

Swartz, H. A. and Vogt, D. W. (1983): Chromosome abnormalities as a cause of reproductive inefficiency in heifers, J. Hered., 74: 320.

Thorely-Lawson, D. A. (1988): Basic virological aspects of Epstein-Barr Virus infection. Semin. Hematol. 25: 247.