

A study of morphological variations of sex chromatin in female students

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Abstract

The inactive X chromosome always form the sex chromatin and the presence of an usually small or large Barr body in the buccal smear indicates the presence of structural variant of the X chromosome. 100 female of M.B.B.S, B.H.M.S, have been voluntarily registered for the present study. In the present study different shapes of sex chromatin like planoconvex, oval, semilunar, round, coma, and bean shaped are observed in normal human females. The morphological variation in the shapes of the Barr body are very meager, hence the present study has been taken.

Key Word: Barr body, bean shape buccal smear, semilunar, squamous cell

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INTRODUCTION

Barr body was discovered by "MURRAYS BARR". Barr body is also called sex chromatin. It is an inactive "x" chromosome present in female somatic cell beneath the nuclear membrane as a hetero plano convex body. Barr bodies are absent in males. Barr body can be identified during inter phase stage of cell cycle. These are found in the nucleus of neutrophils as drumsticks. The sex difference in the morphology of intermeiotic nuclei was first described as a feature of nerve cell in the female cat, by "BARR" and "BERTRAM" in 1949¹. The Barr body exhibits alternation in size, if there is any structural aberration of the sex chromosome such as deletion, ring

or an iso chromosome X. The inactive X chromosome always form the sex chromatin and the presence of an usually small or large Barr body in the buccal smear indicates the presence of structural variant of the X chromosome. However, structural abnormalities of the x chromosome have being reported to affect the size and shape of the x- chromatin (Monre, 1996²). In all mammals, female carries XX sex chromosome compliments bears a corresponding genetic marker called Barr body in most somatic cells and drumstick in some polymorphonuclear leucocytes (Neutrophils) (Bhatia and Shanker 1984³; Omeje *et al.*, 1994⁴). On the contrary the males with XY components, have no Barr body or drumstick but have what is called Y body (Bhatia and Shanker, 1993⁵). The morphological variation in the shapes of the Barr body are very meager, hence the present study has been taken.

MATERIAL AND METHODS

100 female of I M.B.B.S, B.H.M.S have been voluntarily registered for the present study. Immediately after cleaning the mouth, buccal mucosa is gently scraped with one edge of the slide at about 45° angle. The initial superficial layers are discarded. Deeper layers are then smeared across the slide. The slides are allowed to air dry

for 1 minute. The slides are damped with distilled water. Slides are passed through 6N HCl and gently rinsed off with distilled water after 10 seconds. Slides are again washed with distilled water for about 1 minute and Stained with hematoxylin for 15 minutes. Slides are gently washed with distilled water for about 1 minute. Excess water is removed and dried for some time at room temperature. Cells are examined under oil immersion (100x10). Barr bodies are stained as a dark blue or black, and appeared on the inner aspect of the nuclear membrane.

OBSERVATIONS

none of the male students showed the presence of Barr bodies. The number of Barr bodies ranged between 3-18 cells per slide. Maximum number of 18 Barr bodies are found out of a total count of 325 cells, 323cells, 372 cells, 278 cells, taken from four different individuals. There is no relationship between the number of squamous cells and occurrence of Barr bodies. Morphological variations and percentage of sex chromatin Barr bodies of 33 females did not show any morphological variations. All the Barr bodies found are plano convex in their shape (fig.1) Three students showed Plano convex, oval, semilunar and round shaped.(fig.4) Barr bodies in their buccal smears.



Figure 1

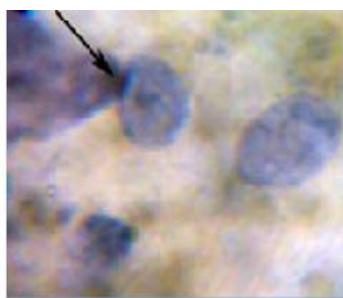


Figure 2



Figure 3

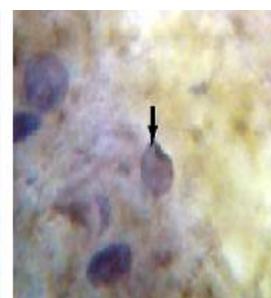


Figure 4

Figure 1: Showing Planoconvex shaped barrbody, HandE, 10×100 mag (oil immersion); **Figure 2:** Showing oval Shaped barrbody, 10×100 mag (oil immersion); **Figure 3:** Showing semilunar shaped barrbody, HandE, 10×100 mag (oil immersion); **Figure 4:** Showing round Shaped barrbody, HandE, 10×100 mag (oil immersion)

Table1: showing no. and % Of plano convex,oval,semilunar, cylindrical shaped barr bodies;

S.No.	No. given to the students	No. of Barr bodies	No. of Plano convex shaped Barr Bodies	No. of oval shaped Barr bodies	No. of semilunar shaped Barr bodies	No. of Cylindrical Shaped Barr bodies
1	1	13	8	3	1	1
2	2	14	8	3	2	1
3	22	16	8	4	3	1
4	73	15	9	2	2	2
1	1	13	61.6%	23%	7.7%	7.7%
2	2	14	57.2%	21.4%	14.2%	7.2%
3	22	16	50%	25.00%	18.75%	6.25%
4	73	15	60.00%	13.30%	13.30%	13.4%

DISCUSSION

Sex chromatin is derived from one of the two X chromosomes in the female which replicates its deoxyribonucleic acid much later than the other and is thus positively heteropyknotic(Dahiya, K. (2016)⁶, Mittwoch, U. (1964)⁷ It leads to condensation of the inactive X chromosome into the heterochromatic sex chromatin. This unique system of differential gene regulation are not well understood, and currently little is known about the molecular components and structure of the Barr body itself(Hong b 2001⁸). In her famous hypothesis from 1961, Mary F. Lyon has been the first to propose the concept of random X chromosome

inactivation as the mechanism of dosage compensation in female mammals, which has later been termed “Lyon hypothesis” and celebrated a widely recognized 50th anniversary in 2011 (Lyon, 1961)⁹. Mary Lyon could rely on earlier studies, mainly from the neuroanatomists Murray Barr and Ewart Bertram in 1949 who provided a first hint for a cytological difference between cells of male and female individuals of the same species (Barr and Bertram, 1949¹). They discovered a nuclear body that was present only in female and not in male neuronal cells in cats, which they termed “sex chromatin” and which was later named “Barr body” . Their discovery fell in a time, where detailed chromosomal analyses for sex

determination (e.g. in sports or intersex disorders) was still impossible and became soon a widely used diagnostics tool. Other important foundations for Lyon's hypothesis has been the work of Susumu Ohno who identified the single condensed ("heteropyknotic") Barr body present in female rat cells as actually being one single X chromosome (Ohno *et al.*, 1959¹⁰). The effect of thalassaemia major, on the frequency and size of sex chromatin have been studied on 157 cases. Three different shapes of sex chromatin were observed, namely, drumstick shaped (single and double in blood smear), tear drop shaped and sessile nodule shaped Barr body in thalassaemia. In the present study different shapes of sex chromatin like planoconvex, oval, semilunar, round, coma, and bean shaped are observed in normal human females. The incidence of X chromatin varies under different conditions in the same tissue. Variations were found by Blanco de del Campo *et al.*, (1965¹¹) in X chromatin counts in buccal smears during the menstrual cycle. Variations in X-chromatin frequency of female cells have been reported under different circumstances: during various hormone treatments (Taylor, 1963¹²; Schetty *et al.* 1966¹³; Dokumov and Spasov, 1968¹⁴); in extensive burns (Weste *et al.*, 1967¹⁵); during menstrual cycles (Blanco de Del Campo and Garcia-Ramirez, 1965¹¹; Hagy and Brodrick, 1972¹⁶) and during pregnancy (Smith *et al.*, 1962¹⁷; Wegman and Smith, 1964¹⁸).

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