Barr Body

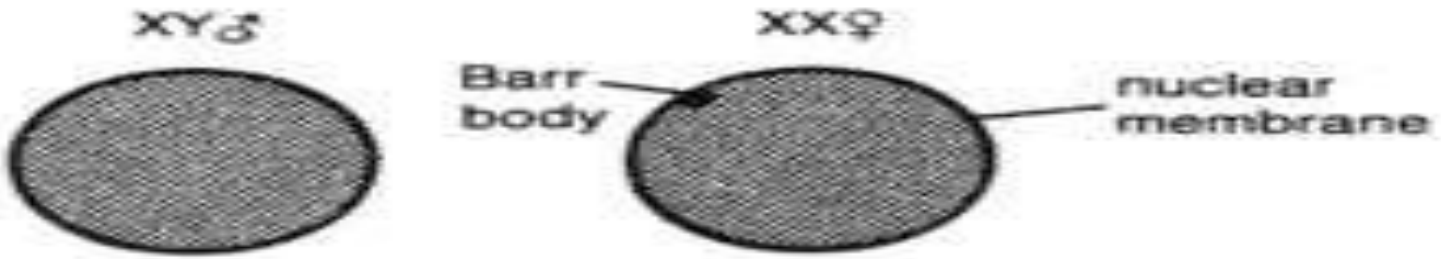
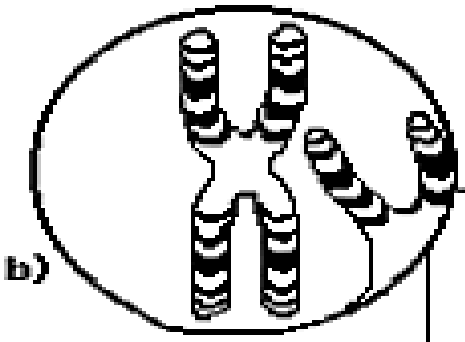
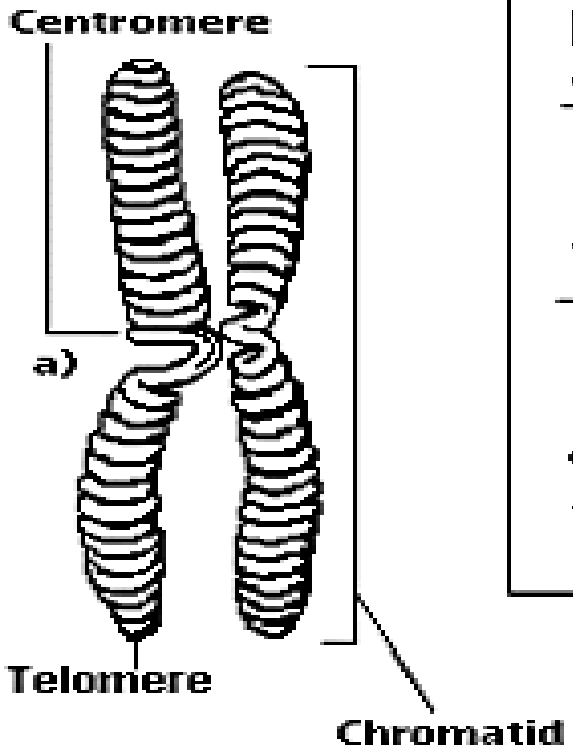
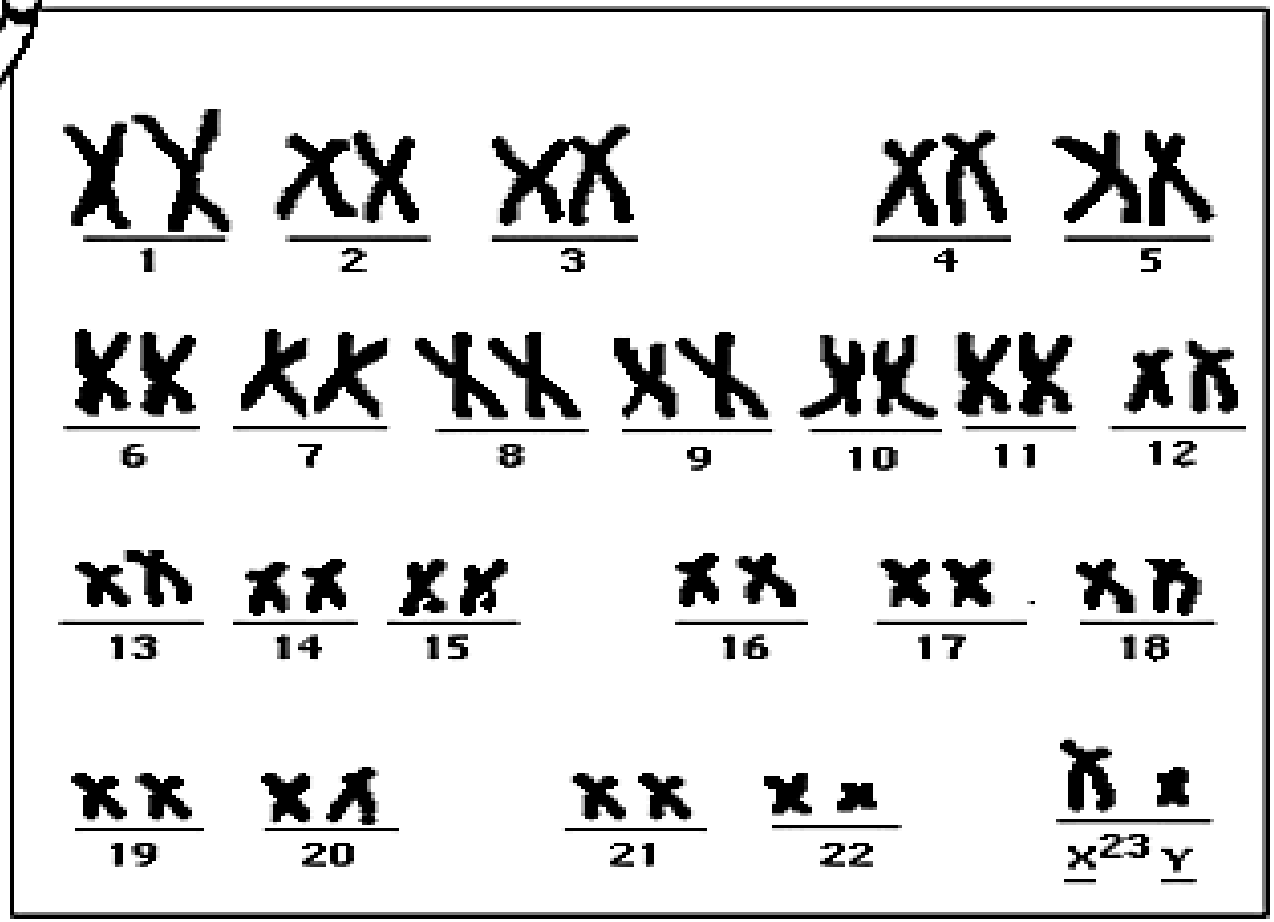


Fig. 61 **Barr body**. Sex chromatin in nuclei from human male and female buccal epithelial cells.

HUMAN CHROMOSOMES







c)

Barr Body

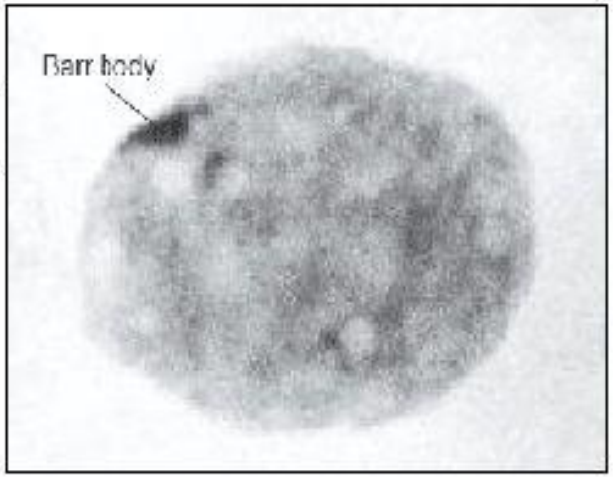
- The Barr body, also sometimes called the sex chromatin, is the inactive X chromosome in female somatic cells. Human females have two X chromosomes, while males have one X and one Y.
- 

- A Barr body (named after discoverer Murray Barr)

Barr body

- = sex-chromatin
- Inactivated X chromosome
- Female XX
  - 1 Barr body
- Male XY
  - no Barr hody

Murray L. Barr



Barr Body

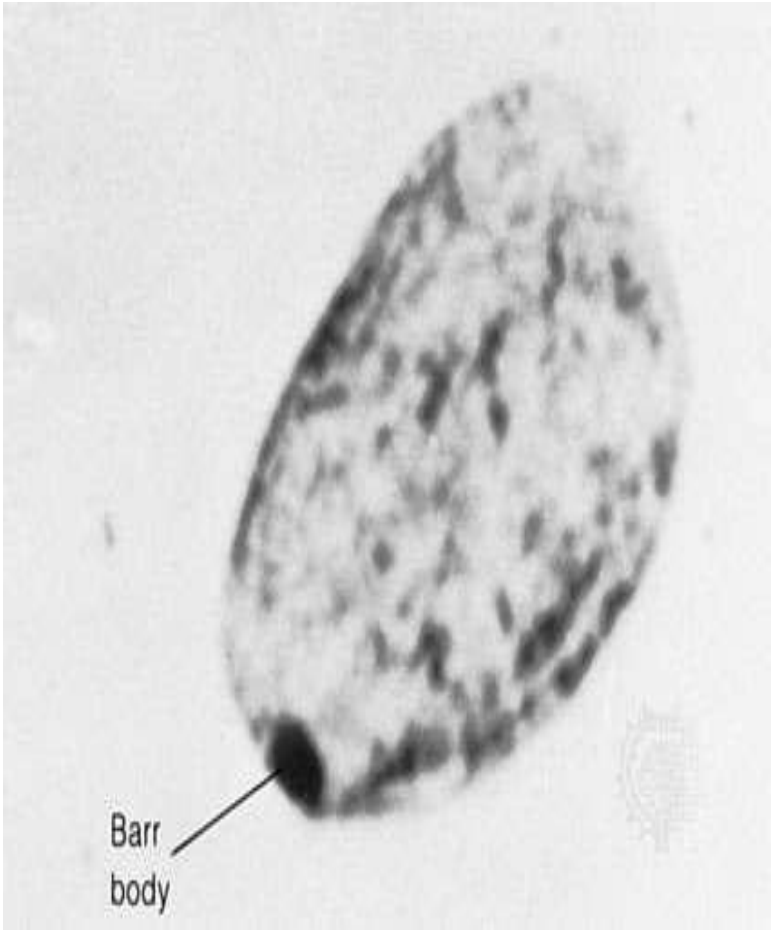
- In all of the female somatic cells, which don't take part in sexual reproduction, one of the X chromosomes is active, and the other is inactivated in a process called lyonization, becoming the Barr body. The reason for shutting off one X chromosome is so that only the necessary amount of genetic information is expressed, rather than double or even more. This is why X-inactivation doesn't only occur in humans, but in all organisms whose gender is determined by the presence or absence of a Y or W chromosome in the cell. In short, the amount of X chromosome genes expressed has to be equal in both males and females.

Barr Body

- The Barr body is packaged in heterochromatin, while the active X chromosome is packaged in euchromatin. This means that although both X chromosomes have the same gene content, the inactive X chromosome is condensed and not easily accessible to molecules involved in transcription, while the active X chromosome has a larger volume, and is more dispersed, or open, allowing for transcription to take place.

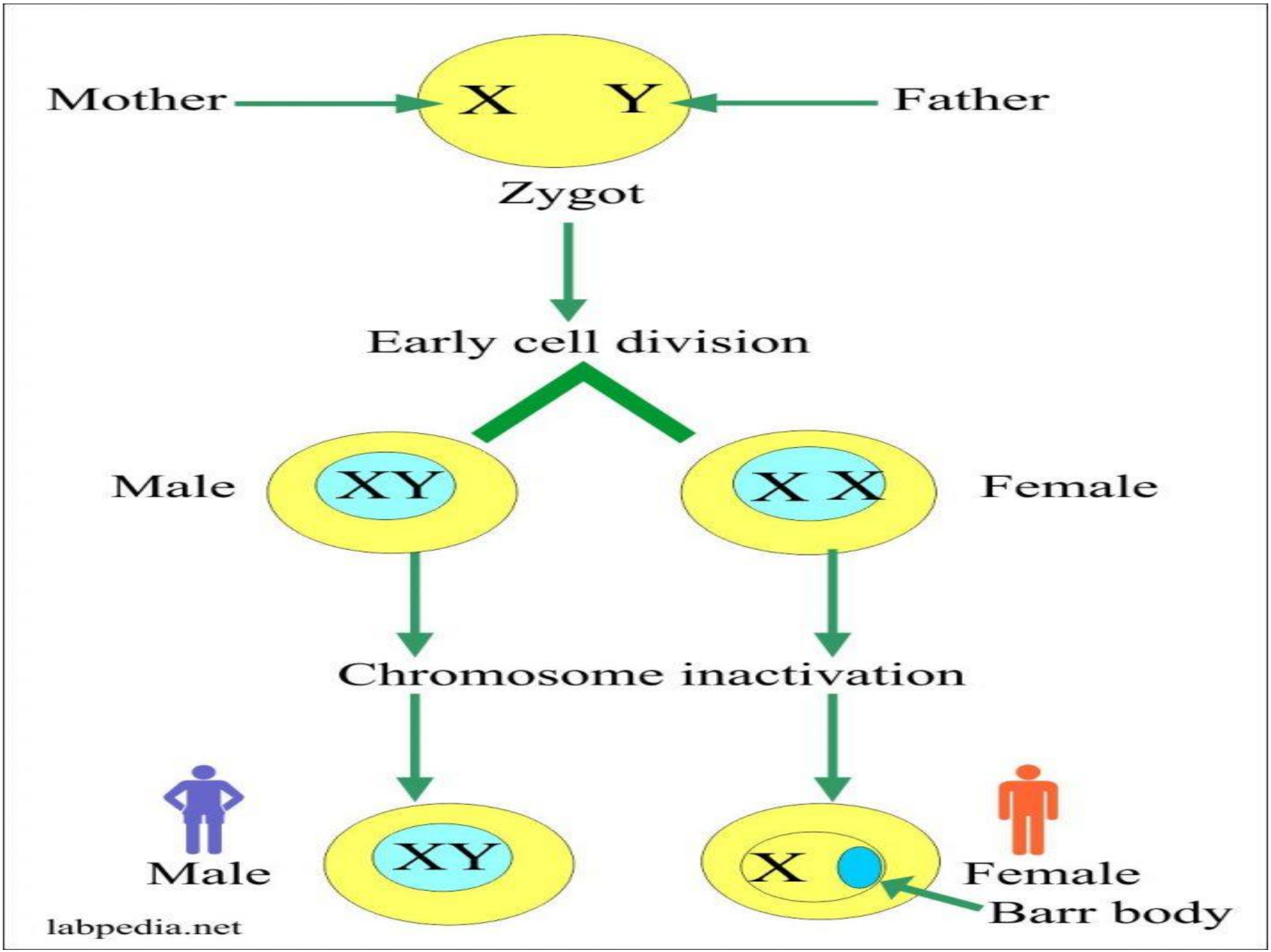
Barr Body

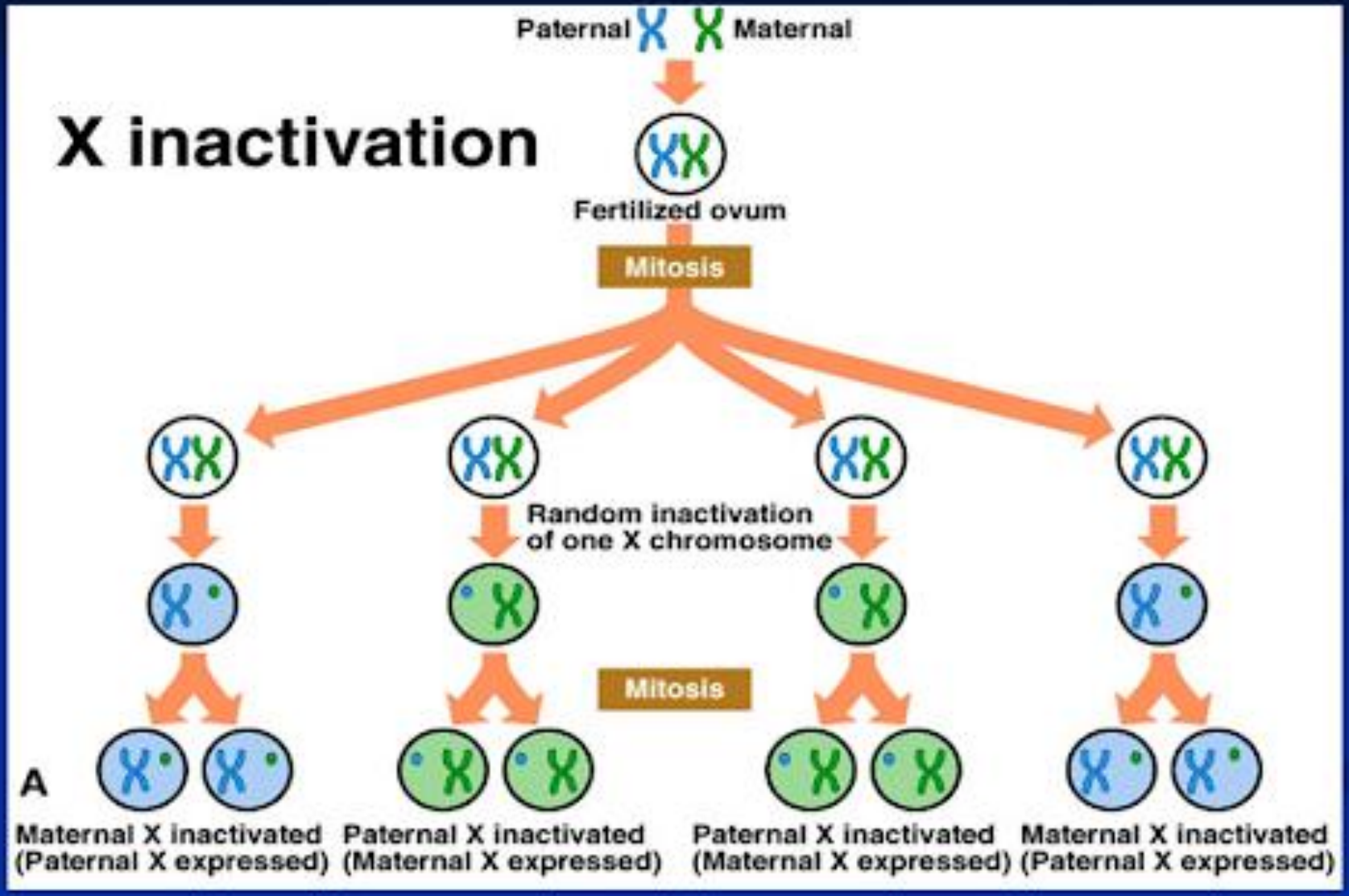
- In X-inactivation, an X chromosome is compacted (or "crumpled up into a ball"), to make a small, dense structure called a Barr body.
- Most of the genes on the Barr body are inactive, meaning that they are not transcribed. This is called dosage compensation.



Which X Chromosome Becomes the Barr Body?

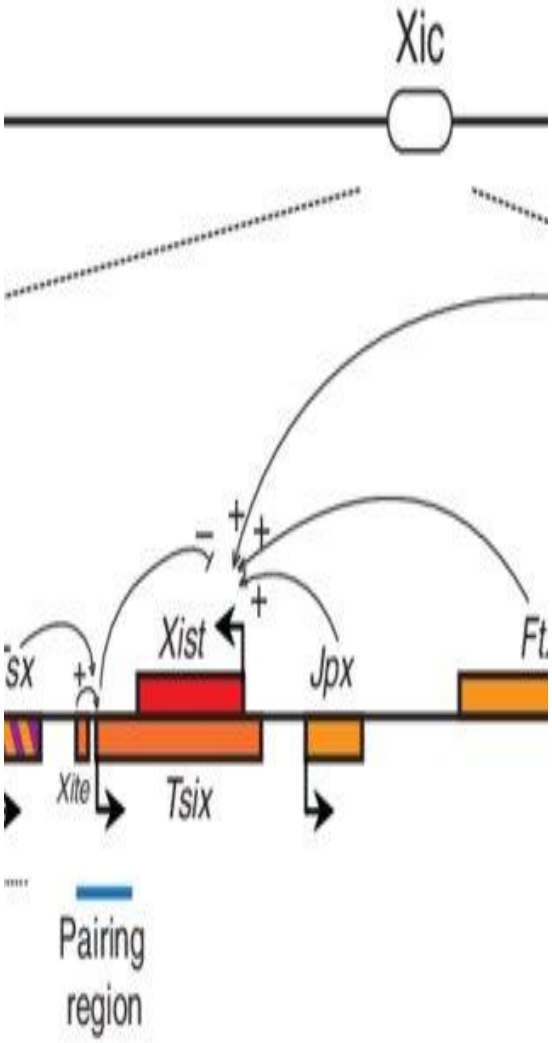
- It is totally random which chromosome becomes inactivated, but within any particular cell, the inactivated X chromosome remains inactive for the cell's whole life. Furthermore, the same chromosome will be inactive in all the cells that descend from the original one, and, needless to say, the same applies to the active X chromosome. Therefore, there's only ever one active X chromosome in any given cell, but it varies which X chromosome it is. For that reason, the number of Barr bodies is always one less than the total number of X chromosomes. This is true even when an individual has a mutation that has led to the presence of extra X chromosomes, as in the case of Klinefelter syndrome in males, where an extra X chromosome is found in all cells.


Mother
X
Y
Father
Zygot
Early cell division
Male
XY
XX
Female
Chromosome inactivation
Male
XY
X
Female
Barr body
labpedia.net



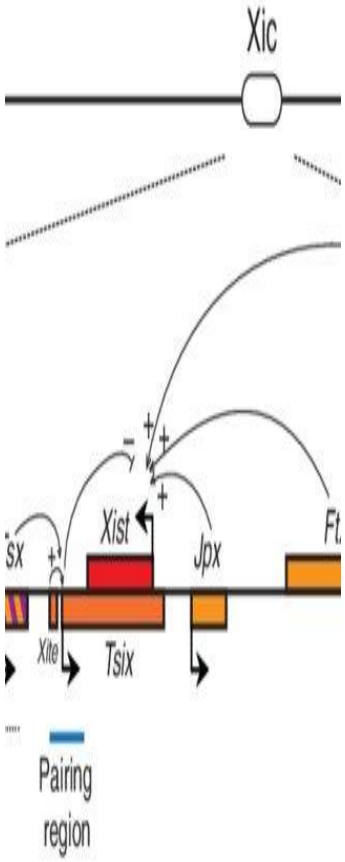
Mechanism of X-inactivation

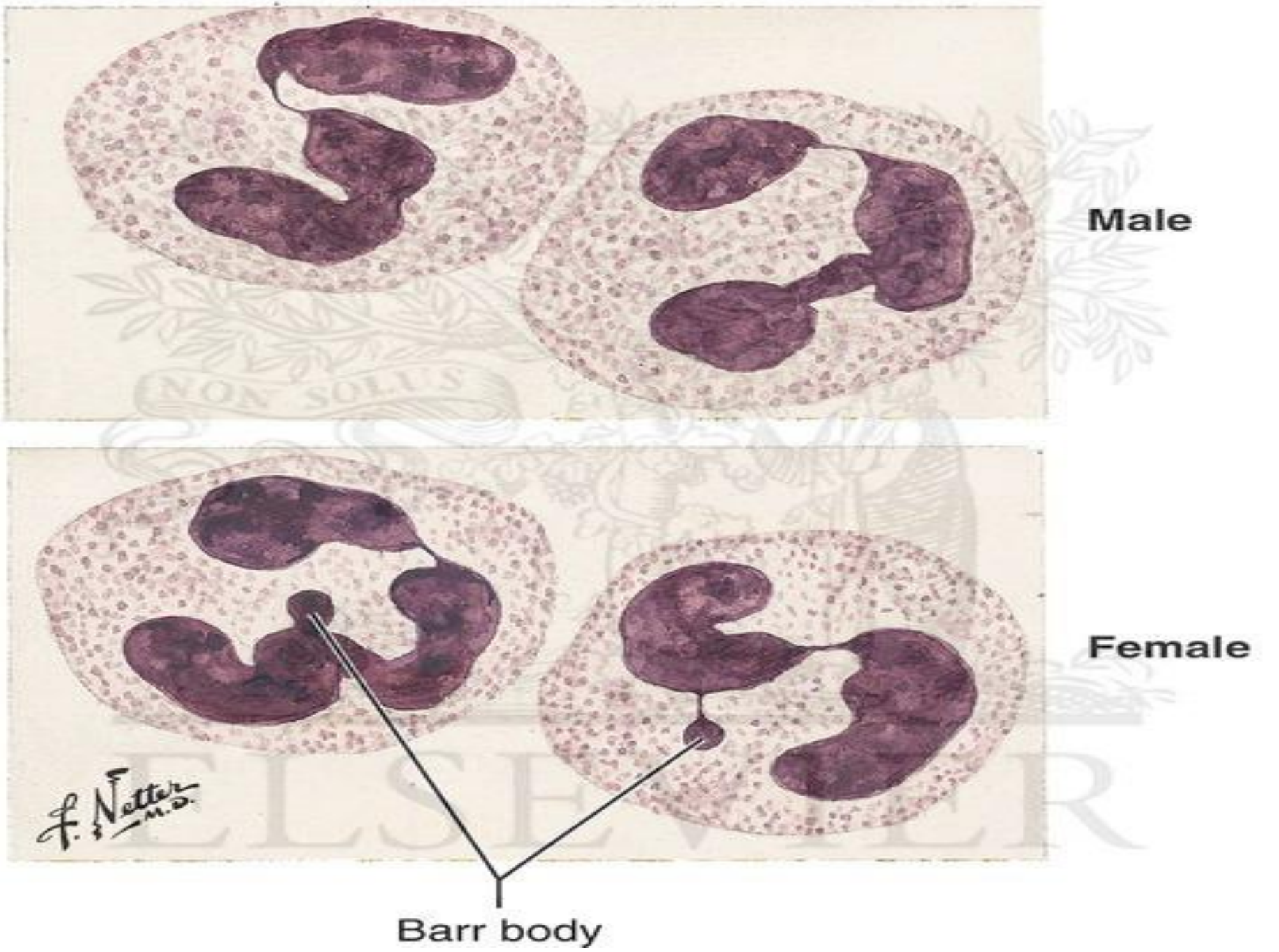
- There is an X-inactivation center (XIC) found near the centromere on the X chromosomes, containing a gene called X-inactive specific transcript (Xist), and another called Tsix (Xist reversed). Xist leads to gene inactivation on the X chromosome, and so we find that the Xi is coated with Xist RNA, while the Xa is not. Tsix, on the other hand, is a negative regulator of Xist, meaning that it opposes its function. Since Xist leads to the silencing of genes, then the presence of Tsix prevents that. Therefore, we find that chromosomes with more Tsix expression are far less likely to become inactivated than those with less Tsix expression.



Mechanism of X-inactivation

- To start, both X chromosomes equally express the Xist RNA, but as the inactivation process begins, the X_i to-be increases the amount of Xist RNA being produced, which then coats this chromosome, silencing its genes. On the other hand, the future X_a stops the expression of the Xist gene, which means that its genes are not silenced, and the chromosome remains active. Of course, the Xist gene on the Barr body is not silenced, and a percentage of the rest of the genes have also been found to escape inactivation. This means that a female who is born with only one chromosome will still have less genes being expressed than a female who has both X chromosome, even though only one X chromosome is fully active in normal females. Like Xist, Tsix RNA is equally expressed on both X chromosomes to start, but that changes as the inactivation process begins taking place.




Male
Female
F. Netter M.D.
Barr body

Barr Body

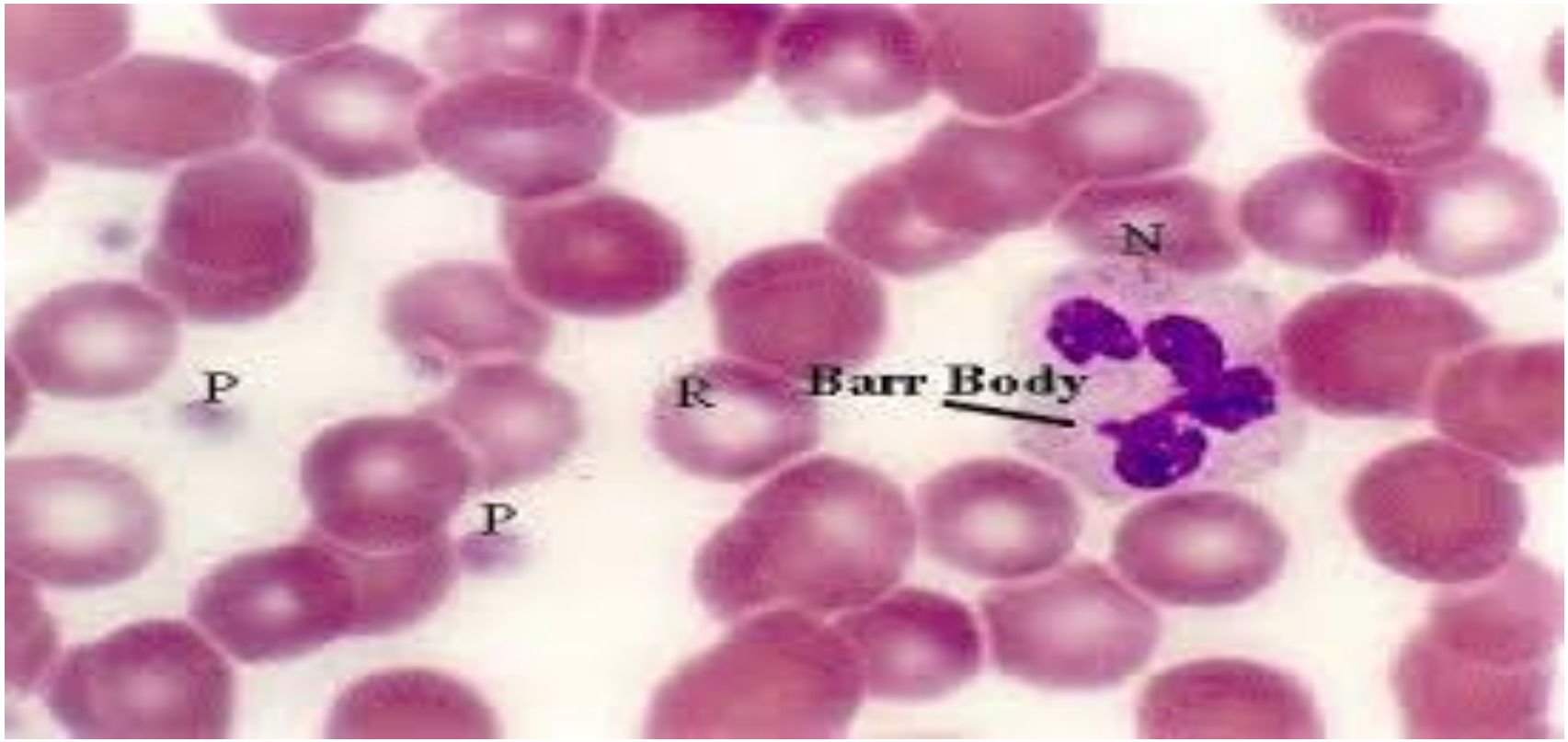
- X-inactivation is a random process that happens separately in individual cells during embryonic development.
- One cell might shut down the paternal X, while another cell might shut down the maternal X instead.
- All the cells descended from each of these original cells will maintain the same pattern of X-inactivation.

Barr Body

- The chromosomes number of Barr bodies in a cell is one less than the number of X. For example:
- In a normal female with the genotype 46XX , the number of Barr bodies would be 1.
- In a normal male with the genotype 46XY, the number of Barr bodies would be 0.

Barr Body

- well-defined body which stains intensely with nuclear dyes.



Barr Body Homework

- Does Turner syndrome have Barr bodies?
- Does Klinefelter syndrome have Barr bodies?
- What about female with down syndrome??
- Blocking Factor?

Thanks for your attention and time!