

# CRITERIA FOR EXTRA CHROMOSOMAL INHERITANCE

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The DNA is the genetic material of us and arranged on chromosomes. It helps to store and transfer information through the process of replication, transcription and translation. Nuclear DNA is the basis for inheritance of almost all types of phenotype of ours. It inherited in a particular fashion from parents to their offspring

Genes located on nuclear chromosomes obey Mendelian inheritance and are segregated in typical Mendelian ratios. But there are certain characters that are transmitted in a non Mendelian fashion. It was first reported by Boris Ephrussi in yeast during 1949. These type of DNA present in some important organelles like mitochondria and chloroplast.

**Definition:** The extra-chromosomal DNA present in cytoplasm and not on chromosomes which follows the non Mendelian pattern of inheritance is known as extra-chromosomal inheritance

**Criteria:** The criteria that present in extra-chromosomal genes are as follows:

- i. It follows a non Mendelian pattern of inheritance..

Unlike the common Mendelian segregation patterns not observed in extra-chromosomal DNA because it does not have the centromere. So it cannot segregated, unlike the normal nuclear DNA.

ii. Maternal inheritance..

In extra-chromosomal inheritance the transmission of a trait usually occurs through only one parent i.e., uniparental inheritance. Uniparental transmission through the mother constitutes maternal inheritance and through father is paternal inheritance. Maternal inheritance is most common uniparental inheritance.

There is a difference between maternal inheritance and maternal effect. Maternal inheritance occurs when the hereditary determinants of a trait are extra-nuclear and genetic transmission is only through the maternal cytoplasm, whereas maternal effect occurs when the nuclear genotype of the mother determines the phenotype of progeny. In maternal effect the hereditary determinants are nuclear genes transmitted by both sexes.

iii. Having own machinery for protein synthesis...

Unlike nuclear DNA, the extra-chromosomal DNA has its own replication and transcription machinery. It synthesizes their own DNA.

iv. Occurs in somatic cells....

The segregation is observed in somatic cells rather than germ cells unlike nuclear inheritance.

**Conclusion:** So we can say that the cytoplasm is one of the most important parts of the cell as it transfers the organelles and also inherits the characters. Any defect in the inheritance of extra-chromosomal genes results in serious physical, mental and biochemical problems

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