

Describe the two mendelians laws of inheritance and discuss to what extent an x l...



Mendelian Laws of Inheritance According to Mendel, every individual has 2 factors for a single trait, one that is inherited paternally and the other that is inherited maternally. Both the factors inherited thus may or may not be identical. These factors are known as genes. Mendel called them factors and they were later termed as genes. In case both the factors are identical, then the individual is called homozygous for that particular trait and if both the factors are non-identical, then the individual is called heterozygous for that particular trait. The two alternative forms of a factor are known as alleles and the genotype of an individual is made up from these alleles (Mueller et al, 2001). Thus, every trait is governed by 2 alleles, one maternal and the other paternal. The genetic make up of any cell with reference to a particular trait is known as genotype and any observable trait like color, etc is known as phenotype. The Mendel Laws are based on the above facts and they are described below. The first law is the Law of Segregation, according to which, when an individual produces gametes, each gamete receives only one copy of the genes. Thus, a single gamete will receive either one or the other allele. During random fertilization of gametes, the alleles unite again and the product has 2 sets of genes. When a particular gene has both recessive and dominant alleles, incomplete dominance occurs (Nussbaum et al, 2004). The expression of the phenotype is morphed by the expression of both dominant and recessive alleles (Biology online). The second law is the Law of Independent Assortment. This is also known as the Inheritance Law. According to this law, alleles of different genes undergo independent assortment of one another during the formation of gametes (Jorde et al, 1995). Different traits are inherited independently of each other, with no relationship to each other with regard to inheritance. Independent assortment occurs during phase-2

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meiosis in eukaryotes, in metaphase-1. The gamete produced is a mixture of maternal and paternal chromosomes and this is known as chromosomal crossover. This leads to novel genetic combinations and is the cause for increasing genetic diversity (Biology online). While the above laws are applicable to all chromosomes, for sex chromosomes, the laws are applicable in slightly modified form. In human, the male has X and Y chromosome and the female has 2 X chromosomes. Thus males are heterogametic and females are homogametic. When a male gamete containing X chromosome fertilizes a female gamete, the zygote is XX and a female is formed from this zygote. If the male gamete containing Y chromosome fertilizes female gamete, the genotype of the zygote would be XY, resulting in male. Thus, sons inherit X-chromosome only from their mothers and hence sons cannot inherit genetic diseases that are dependent on the X chromosome from their father. Daughters inherit genes related to X chromosome from their fathers with 100 percent certainty. From the mothers, they inherit only one X chromosome and their acquisition of genetic disease related to X chromosome depends on whether it was from the father or the mother. Since X chromosome is present in hemizygotic state among males, females frequently act as heterozygotes and transfer recessive alleles for genetic diseases without having any symptoms. These diseases are manifested by the hemizygote males. Hemophilia and color blindness are classical examples of X-linked inheritance (Nussbaum et al, 2004). References Mueller, R. F., Young, I. D., and Emery, A. E. H. (2001). *Emery's elements of medical genetics*. Singapore: Churchill Livingstone. Nussbaum, R. L., McInnes, R. R., Willard, H. F., and Thompson, M. W. (2004). *Genetics in Medicine*. London: Elsevier Health Sciences. Jorde, L. B., Carey, J. C., and <https://assignbuster.com/describe-the-two-mendelians-laws-of-inheritance-and-discuss-to-what-extent-an-x-linked-genes-do-not-follow-mendelian-laws/>

White, R. L. (1995). Medical genetics. London: Mosby. Biology Online. (2006).

Mendel's Law & Mendelian Genetics. Retrieved on 2nd April, 2011 from

http://www.biology-online.org/2/5_mendelian_genetics.htm