About Colour blindness

A person with the condition called colour vision deficiency is unable to distinguish certain colours or in case of total colour blindness the person is unable to see any colour at all. Colour blindness may be connected with decreased visual acuity. In case of total colour blindness, the condition is called achromatopsia. The incapacity to see just specific colours is called dyschromatopsia (Pic. 1). The ability to see colour is enabled thanks to the presence of three types of cone photoreceptors in the retina of human eye. Depending on the number of defective or missing cone photoreceptors types the colour blindness can be divided into anomalous trichromacy, dichromacy and monochromacy. Colour vision deficiency is often a result of genetic predisposition and may be related to some reproduction disorders of genetic origin such as Kallmann syndrome. Colour vision deficiency due to genetic predisposition is called as congenital dyschromatopsia. The colour vision deficiency may be also caused by physical damage to the brain, optic nerve or the retina of an eye. The intake of certain chemical substances can also cause the alteration of colour vision (e.g. chloroquine used to treat specific diseases such as lupus, malaria and others).

Yet most prevalent cause of vision deficiency is genetic disorder. The genes that take part in formation of colour vision are located on the female sex chromosome (X). The capacity of gene expression may depend on the presence of so called recessive alleles and dominant alleles which represent different forms of the same gene located on homologous chromosome (all nucleated cells in the body except gametes contain two set of chromosomes reffered as homologous chromosomes). The presence of recessive alleles of “vision genes” on the chromosome cause the colour vision deficiency. Since
man poses just one chromosome X, they are more likely to suffer from colour blindness (up to 10% of male population have colour blindness). On the other hand, women are more likely to avoid this complication since they possess two chromosomes X which increase the chances that at least one chromosome X will contain dominant alleles of the genes responsible for colour vision.

**Kallmann syndrome**

A genetic disorder called Kallmann syndrome affecting chromosome X (Pic. 2) is a condition of congenital hypogonadotropic hypogonadism (CHH). The term hypogonadotropic hypogonadism refers to decreased production of gonadotropin releasing hormone (GnRH) in the hypothalamus and consequential underdevelopment of reproductive organs and related reproduction problems such as low sperm production. To differentiate Kallmann syndrome from others types of hypogonadotropic hypogonadism, the sense of smell is tested. The absence of smell (anosmia) or lowered smell capacity (hyposmia) due to agenesis or underdevelopment of olfactory bulbs (smell neurological centre) is the most typical symptom of Kallmann syndrome. Nevertheless, other senses can be affected by this genetic disease too, such as the vision. The vision alteration in Kallmann syndrome may manifest by the colour blindness.

**Find more about related issues**

**Diagnoses**

**Kallmann syndrome**
A genetic condition where the primary symptom is a failure to start puberty or a failure to fully complete puberty.
Learn more at: [www.fertilitypedia.org/therapy/diag/kallmann-syndrome](http://www.fertilitypedia.org/therapy/diag/kallmann-syndrome)
Pic. 1: Regular colour vision vs. colour vision deficiency
Examples of altered colour vision depending on the type of cone photoreceptor that is not working properly or missing.

Pic. 2: Chromosome X and the inheritance
The picture shows the way how the inheritance of genes located on chromosome X works (such as genes responsible for colour vision capacity).

Sources

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