Hereditary health problems - an overview

'Hereditary' means inherited or genetic.

Dogs are made of billions of cells and these cells contain chromosomes. A dog has 39 pairs of chromosomes per cell (78 in total). 39 inherited from the dam and 39 from the sire (38 autosomal chromosomes and 1 sex chromosome). The chromosomes contain genes. Genes are made up of DNA and this provides the dog's blueprint.

Congenital disorders (i.e. present at birth) are caused by an abnormal gene or genes. If an abnormal gene is passed down from the sire or dam the condition is hereditary. If a gene has mutated (e.g. because the dam was exposed to a toxin when pregnant) the disorder is not hereditary.

Certain breeds can be predisposed to certain inherited health problems.

Although a congenital defect is present at birth the condition may not become apparent until later in life.

Sex chromosomes
The female genotype is XX and male is XY. The dam can only pass on an X. The sire can pass an X or a Y - thus determining the sex of the puppy.

Autosomal chromosomes
Contain information about the dog's genetic physical or behavioural traits such as height, colour, guarding instinct etc.

A gene can be either 'dominant' or 'recessive'. Dominant over-rides recessive.

Autosomal dominant - an abnormal gene inherited from one parent is enough to cause the disorder. An example is malignant hyperthermia (a skeletal muscle disorder where anaesthesia causes a sudden extreme rise in body temperature).

Autosomal recessive - an abnormal gene must be inherited from each parent to cause the disorder. If the puppy receives one abnormal gene and one normal gene they will be unaffected but carry the abnormal gene and can pass it on to their offspring. They are known as 'carriers'. An example is canine multi-focal retinopathy (an eye disease where lesions develop on the retina).

Some conditions can be autosomal dominant in certain breeds and autosomal recessive in others. An example of this is progressive retinal atrophy (a disease of the retina that leads to blindness), which is normally recessive but dominant in Mastiffs and Bullmastiffs.

Sex linked conditions
These are caused by an abnormal gene on the X or Y sex chromosome.

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X-linked = abnormal gene on the X chromosome. Females have two X chromosomes. If one is abnormal they'll be a carrier. If both are abnormal they will be affected. Males only have one X so if it is abnormal they will be affected.

An example of an X-linked condition is Canine Hemophilia (a rare disorder where the blood doesn't clot properly).

Y-linked = females have no Y chromosomes so are always unaffected. Males have one Y chromosome so will always be affected. There are no known Y-linked disorders in dogs.

Polygenic conditions
This is where multiple genes are involved. The main example is hip dysplasia (abnormalities of the hip joint).

Preventing health problems
A reputable breeder tries to avoid breeding an inherited condition by testing and not using affected dogs.

Dominant genes are easier to identify. Any dog with the abnormal gene will be affected and shouldn't be used. The problem is the condition may not appear until after the dog has been bred.

Recessive genes are not so easy to identify. They can be carried down generations before being paired with another abnormal gene. Genetic testing can sometimes be used. The breeder should also look at family history and perhaps do test breeding. For example, if a puppy is affected but the parents aren't they must be carriers. The problem with this is a dog may not be used because of family history but it could be unaffected and might be an excellent example of the breed. This is more of an issue if the gene pool is small.

Due to the fact multiple genes are involved polygenic problems are more complex. Health screening can be very useful. An example of this is hip scoring and only breeding from dogs with low scores in an effort to try and tackle hip dysplasia. However, this alone is not foolproof. Two sound dogs can produce affected offspring and two affected dogs can produce sound offspring. Environmental factors can also have a bearing. It is important that breeders take family history into account too in an effort to reduce the risk.