

Hereditary health problems - illustrated

AUTOSOMAL RECESSIVE

KEY: - N = normal gene and D = defective gene.

Clear - genotype is N/N (homozygous normal). The dog does not carry the defective gene and will never develop the condition.

Carrier - genotype is N/D (heterozygous carrier). The dog has one copy of the normal gene and one copy of the defective gene. It will never develop the condition but can pass a copy of the defective gene on to its offspring.

Affected - genotype D/D (homozygous affected). The dog has two copies of the defective gene. It will develop the condition and if bred will pass a defective gene on to its entire offspring.

Sire x Dam = Offspring

Clear (N/N) x Clear (N/N) = 100% clear (N/N)

Clear (N/N) x Carrier (N/D) = 50% clear (N/N) and 50% carriers (N/D)

Clear (N/N) x Affected (D/D) = 100% carriers (N/D)

Carrier (N/D) x Clear (N/N) = 50% clear (N/N) and 50% carriers (N/D)

Carrier (N/D) x Carrier (N/D) = 25% clear (N/N), 25% affected (D/D) and 50% carriers (N/D)

Carrier (N/D) x Affected (D/D) = 50% carriers (N/D) and 50% affected (D/D)

Affected (D/D) x Clear (N/N) = 100% carriers (N/D)

Affected (D/D) x Carrier (N/D) = 50% carriers (N/D) and 50% affected (D/D)

Affected (D/D) x Affected (D/D) = 100% affected (D/D)

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AUTOSOMAL DOMINANT

KEY: - N = normal gene and D = defective gene.

Clear - genotype is N/N (homozygous normal). The dog does not carry the defective gene and will never develop the condition.

Affected - genotype N/D (heterozygous affected) or D/D (homozygous affected). These dogs will develop the condition and pass a defective gene on to their entire offspring.

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Sire x Dam = Offspring

Clear (N/N) x Clear (N/N) = 100% clear (N/N)

Clear (N/N) x Affected (N/D) = 50% clear (N/N) and 50% affected (N/D)

Clear (N/N) x Affected (D/D) = 100% affected (N/D)

Affected (N/D) x Clear (N/N) = 50% clear (N/N) and 50% affected (N/D)

Affected (N/D) x Affected (N/D) = 25% clear (N/N), 25% affected (D/D) and 50% affected (N/D)

Affected (N/D) x Affected (D/D) = 50% affected (N/D) and 50% affected (D/D)

Affected (D/D) x Clear (N/N) = 100% affected (N/D)

Affected (D/D) x Affected (N/D) = 50% affected (N/D) and 50% affected (D/D)

Affected (D/D) x Affected (D/D) = 100% affected (D/D)

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X-LINKED RECESSIVE

This is the most common type of X-linked inheritance.

KEY: - XY = male and XX = female. x = defective X chromosome.

Clear - genotype is XX or XY. The dog does not carry the defective gene and will never develop the condition.

Carrier female - genotype is Xx (heterozygous carrier). The dog will never develop the condition but can pass a copy of the defective gene on to its offspring.

Affected female - genotype xx (homozygous affected). The dog will develop the condition and if bred will pass a defective gene on to its entire offspring.

Affected male – genotype is xY. The dog will develop the condition and if bred it will pass a defective gene on to all female offspring.

Sire x Dam = Offspring

Clear (XY) to Clear (XX) = Clear (XX) or Clear (XY).

Clear (XY) to Carrier (Xx) = Clear (XX) or Carrier (Xx) female offspring and Clear (XY) or Affected (xY) male offspring.

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Clear (XY) to Affected (xx) = Carrier (xX) female offspring and Affected (xY) male offspring.

Affected (xY) to Clear (XX) = Carrier (Xx) female offspring and Clear (XY) male offspring.

Affected (xY) to Carrier (Xx) = Carrier (xX) or Affected xx female offspring and Clear (XY) or Affected (xY) male offspring.

Affected (xY) to Affected (xx) = Affected (xx) female offspring and Affected (xY) male offspring.

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X-LINKED DOMINANT

This form of X-linked inheritance is rare in dogs.

KEY: - XY = male and XX = female. X* = defective X chromosome.

Clear - genotype is XX or XY. The dog does not carry the defective gene and will never develop the condition.

Affected female - genotype X*X*(homozygous affected). The dog will develop the condition and if bred will pass a defective gene on to its entire offspring.

Affected female – genotype X*X (heterozygous affected). The dog will develop the condition and if bred can pass a defective gene on to its offspring.

Affected male – genotype is X*Y. The dog will develop the condition and if bred it will pass a defective gene on to all female offspring.

Sire x Dam = Offspring

Clear (XY) to Clear (XX) = Clear (XX) or Clear (XY).

Clear (XY) to Heterozygous Affected (X*X) = Clear (XX) or Heterozygous Affected (XX*) female offspring and Clear (XY) or Affected (X*Y) male offspring.

Clear (XY) to Homozygous Affected (X*X*) = Heterozygous Affected (XX*) female offspring and Affected (X*Y) male offspring.

Affected (X*Y) to Clear (XX) = Heterozygous Affected (XX*) female offspring and Clear (XY) male offspring.

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Affected (X^*Y) to Heterozygous Affected (X^*X) = Heterozygous Affected (X^*X) or Homozygous Affected (X^*X^*) female offspring and Affected (X^*Y) or Clear (XY) male offspring.

Affected (X^*Y) to Homozygous Affected (X^*X^*) = Homozygous Affected (X^*X^*) female offspring and Affected (X^*Y) male offspring.

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Y-LINKED

There are no known Y-linked conditions in dogs.

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POLYGENIC

This type of condition is caused by a combination of defective genes (as well as environmental factors) so it's impossible to illustrate this simply.