

Lethal genes are mutant genes and result in the death of the individual which carries them. Lethal gene occurs due to mutation of normal genes. A fully (completely) dominant lethal allele kills both in homozygous and heterozygous states. Individuals with a dominant lethal allele die before they can leave progeny. Therefore, the mutant dominant lethal is removed from the population in the same generation in which it arose. Recessive lethal kill only when they are in a homozygous state and there may be two kinds, 1. One which has no obvious phenotypic effect in heterozygote & 2. One which exhibits a distinctive phenotype when heterozygous.

The completely lethal genes usually cause death of the zygote later in the embryonic development or even after birth or hatching. Complete lethality, thus, is the ~~cause~~ case, where no individuals of a certain genotype attain the age of reproduction.

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7 SUN However, in many cases lethal gene individual become operative at the time the such lethal gene, which sexually mature. do not destroy their possessor are called subvital, sublethal or semilethal genes.

one lethal allele modifies the 3:1 phenotypic ratio into 2:1.

Example -

Lethal alleles in Animals -

8 MON Among animals, the following three examples exhibit the role of recessive lethal alleles.

1. The inheritance of mouse body colour was studied by the French geneticist, L. Cuenot in 1905. The coat colour of mice is governed by a multiple allelic series in which 'A' allele determine agouti or mousey coloured coat, A^y allele determine yellow coat and 'a' allele forms black coat. The dominance

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A A ~

hierarchy is as follows: $A^y > A > a$. The A^y allele also acts as a recessive lethal, since in the homozygous state (~~$A^y A^y$~~) ($A^y A^y$), it kills the individual in early embryonic stage (i.e. during gastrulation). Thus when two yellow coated heterozygotes ($A^y A$) are crossed, they produce a progeny showing a ratio of 2:1 since homozygous yellow $A^y A^y$ individuals are never born due to the lethal effect of A^y gene.

9 TUE

Parents \rightarrow ♀ Yellow $A^y A$ \times Yellow ♂ $A^y a$
 (Hybrid of yellow & agouti) \downarrow (Hybrid of yellow & black)
 Progeny \rightarrow $1 A^y A^y$; $2 A^y A$; $1 Aa$
 10 WED

$A^y A^y$ (Homozygous yellow) (die in uterus).

$2 A^y A$ Heterozygous yellow

$1 Aa$ Agouti.
 or 2 yellow ; 1 Agouti
 or 2:1.

Heterozygous yellow ♀ Yy \times heterozygous black ♂ Yb

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Notes:

Gametes	Y	b
Y	YY (Die)	Yb yellow
y	yY yellow	yb black

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11 THU In cattle, a recessive lethal gene in homozygous condition (aa) causes calves to born "amputated" which die soon after birth. The cross betⁿ two carriers (at) produces the following results:

Parents Normal × Normal
gametes at at
a + a +
progeny 1 aa : 2 at : 1 + +
die normal
• Amputated

12 FRI

2. In chicken an incompletely dominant genes (CP) in heterozygous condition (CP/+) cause 'creepers' conditions. The creeper birds have much shortened and deformed legs & wings, giving them a squatty appearance and creeping gait. A cross of two creeper birds yields viable offsprings in the ratio of 2 creepers : 1 normal. The

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homozygous creepers having such a gross deformities that they die during incubation. 13 SAT

F₁: CP/+
Creeper
Heterozygous) x CP/+
Creeper

F₂: 1 cp/cp : 2 cp/+ : 1 +/+ (also
creepers Normal (Homozygous)
Homozygous die Heterozygous.

In human beings.

14 SUN

In human several hereditary diseases have lethal effects. Few important are as follows-

① Congenital ichthyosis - One of the most typical cases of a recessive lethal gene in man is expressed in congenital ichthyosis. At birth children afflicted with this disease have a crusted leathery skin with deep fissures down to the subcutaneous tissue; the fissures lead to

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bleeding, infection and death.
15 MON Congenital ichthyosis occurs only when there occurs homozygous condition for its recessive lethal genes.

2. Infantile amaurotic idiocy - A

recessive allele in homozygous condition causes a fatal disease called infantile amaurotic idiocy in juvenile stage. Bearers of this genotype begin to lose their eye sight betⁿ the age of four to seven years. The complete blindness is followed by

16 TUE mental degeneration and finally death before adolescence.

3. Thalassemia; Thalassaemia or Cooley's anaemia is a haemoglobin disease somewhat similar to sickle cell anaemia. It occurs mostly in children.

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