

Alien genetics activity

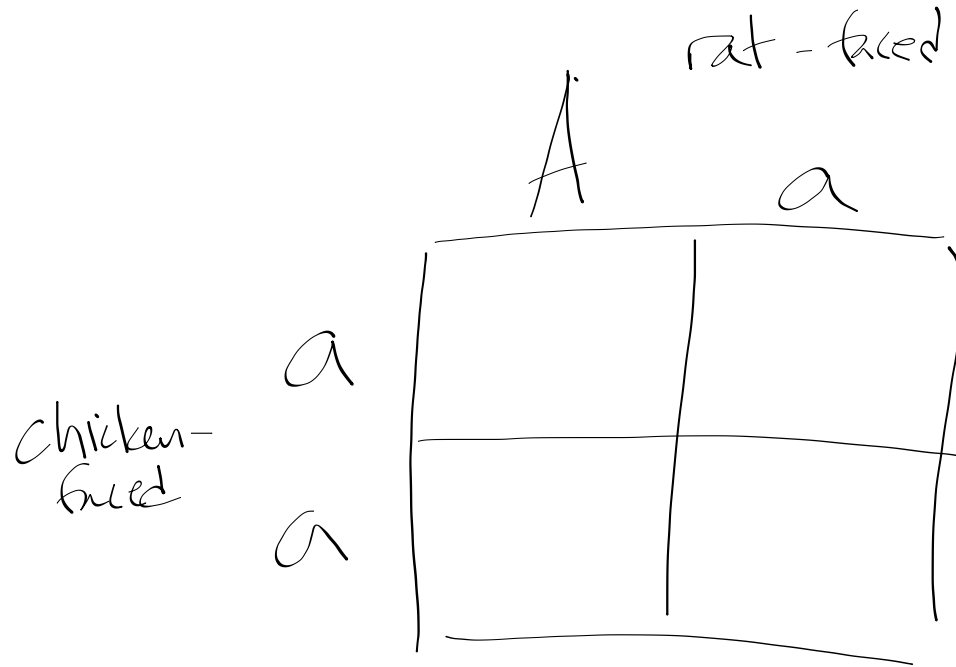
Virtual Drosophila Lab

Vocab - dominant,
recessive, allele, genotype,
phenotype, sex-linked, autosomal
PRACTICE TO LEARN

Solving a
genetic mystery!
You know:
phenotypes of parents
phenotypes of offspring

PUNNETT SQUARES -

Make them, interpret them,
add info (phenotype), describe genotypes



- ① Fill it in
- ② Describe parents & offspring phenotypes
- ③ Predict probabilities (genotypes/phenotypes)

Traits?

Rat - faced

chicken - faced

A (dominant) - rat - faced

a (recessive) - chicken - faced

Solving genetic mysteries:

- Don't make assumptions (mutant trait could be recessive or dominant)
 - Make all possible Punnett Squares
 - Make some with dominant mutant trait
 - Make some with recessive mutant trait
 - Make some where dominant trait is homozygous
 - Make some where dominant trait is heterozygous
 - Make some for each cross
 - Start with offspring?
 - Pick the set of Punnett Squares that fit the data!
- organisms that have dominant phenotype

A biologist mates two fruit flies. The male is wild type (completely normal appearance in every respect). The female has double appendages – she has 12 legs instead of six, and she has four antennae instead of two.

There are about 1600 offspring. Roughly half (about 800) of the offspring have double appendages. The rest are wild type. There are no differences in the rate of mutation between males and females.

The biologist then mates two of the mutant offspring. There are an additional 1600 flies that hatch from the second breeding. Again, there are no differences in the rate of mutation between males and females. The offspring of this breeding show a rate of around 75% (around 1200) mutants and the remaining 25% of the flies are wild type.

Draw the Punnett Squares that illustrate these crosses. Then answer the following questions:

1. Is the mutant trait dominant or recessive?
2. Is the mutant trait sex-linked or autosomal?
3. What were the genotypes of the parents of the initial cross?
4. What were the genotypes of the parents of the second cross?

What if... wild type is dominant?

$D \rightarrow$ wild type

$d \rightarrow$ mutant (2x appendages)

male could be heterozygous or homozygous dominant

female must be homozygous recessive

possibility 1
male

	D	d
d	Dd	dd
d	Dd	dd

50% = heterozygous (wild type)

50% = homozygous recessive (2x)

possibility 2
male

	D	D
d	Dd	Dd
d	Dd	Dd

100% wild type

What if... mutant allele is dominant? D - 2x appendages
 d - wild type

male must be homozygous recessive

female could be heterozygous or homozygous dominant

possibility 3

		d	d
female	D	Dd	Dd
	d	dd	dd

50% 2x
 50% wild type

possibility 4

		d	d
female	D	Dd	Dd
	D	Dd	Dd

100% mutant

What if
 $D = \text{wild type}$
 $d = \text{mutant}$

possibility 1
male

	D	d
d	Dd	dd
d	Dd	dd

mutants

2nd cross

mutant male

d d

d	dd	dd
d	dd	dd

100% mutants

mutant
female

what if...
 D = mutant (2x)
 d = wild type

possibility 3

		d	d
female	D	Dd	Dd
	d	dd	dd

mutants

2nd cross

		mutant male D	d
mutant female	D	DD	Dd
	d	Dd	dd

75% mutants (2x)
 25% wild type

- ① Mutant trait is dominant
- ② Autosomal
- ③ Male: dd (homozygous recessive)
Female: Dd (heterozygous)
- ④ All heterozygous

A biologist mates two fruit flies. The female is wild type (completely normal appearance in every respect). The male has no legs.

There are about 1600 offspring. All of the offspring are wild type.

The biologist then mates two of the offspring. There are an additional 1600 flies that hatch from the second breeding. The offspring of this breeding show a rate of around 75% (around 1200) wild type and the remaining 25% of the flies have no legs. There are no differences in the proportion of mutants between males and females.

Draw the Punnett Squares that illustrate these crosses. Then answer the following questions:

1. Is the mutant trait dominant or recessive?
2. Is the mutant trait sex-linked or autosomal?
3. What were the genotypes of the parents of the initial cross?
4. What were the genotypes of the parents of the second cross?

What if... ~~legless allele is dominant?~~ L - legless
DOESN'T WORK... Q - wild type

1st cross: ♀ → must be QQ

♂ → could be LL or LQ

♂

		L	L
♀	Q	LQ	LQ
	Q	LQ	LQ

100% no legs

♂

		L	Q
♀	Q	LQ	QQ
	Q	LQ	QQ

50% no legs 50% wild type

What if... wild type allele is dominant? L - wild type
 l - legless

♀ could be LL , Ll

♂ must be ll

♀

L	Ll	Ll
L	Ll	Ll

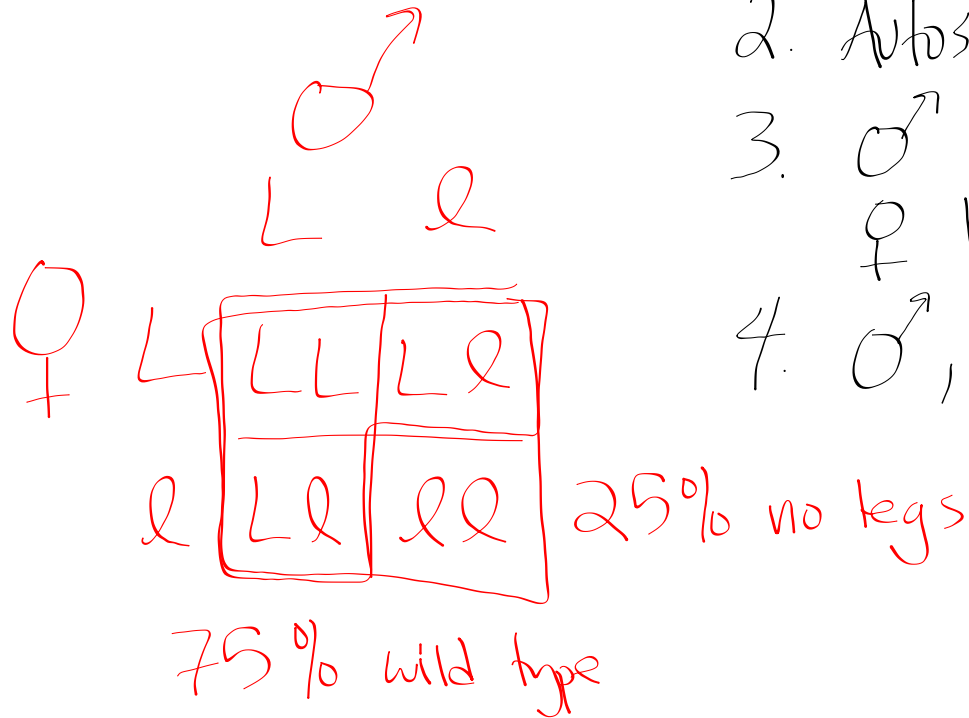
100% wild type

♀

L	Ll	Ll
l	ll	ll

50% wild type
50% no legs

2nd cross ...



1. Legless allele is recessive
2. Autosomal (not sex-linked)
3. ♂ homozygous recessive
♀ homozygous dominant
4. ♂, ♀ both heterozygous