Class 24 10/18/17 human genetics

- Announcements
- Class administration
- Check iLearn for suggested problems
- **OFFICE HOURS**
  - **10/16 rescheduled to THU 10/19 3-5pm, HH668C**
  - **10/23 rescheduled to THU 10/26 3-5pm, HH668C**

Romberg Tiburon Center Seminar Series

http://rtc.sfsu.edu/seminar/index.htm

Wednesday, 10/18/17
Bay Conference Center, 3:30PM

Graduate Student Presentations

Jeffrey Blumenthal (Hines lab)
Environmental Covariates and Oyster Drill Snail Distribution in Richardson Bay, CA

Samantha Cope (Hines lab)
Evaluating Threats to Marine Mammals from Vessel Traffic in an Urbanized Estuary

Kaytlin Ingman (Hines lab)
Long Term Trends in Baleen Whale Sightings Near the Farallon Islands California

Jane Rudebusch (Hines lab)
Anthropogenic Stressors on Sea Otters Re-settling San Francisco Bay

Biol 871 Colloquium in Microbiology, Cell & Molecular Biology

Thursday, 10/19/17
SCI 210, 2:10 pm

http://biology.sfsu.edu/content/MCMB

Aaron Hardin
UCSF
How mammals gain additional mammary glands

http://profiles.ucsf.edu/aaron.hardin

Biol 572/872 Ecology, Evolution, & Conservation Biology Colloquium

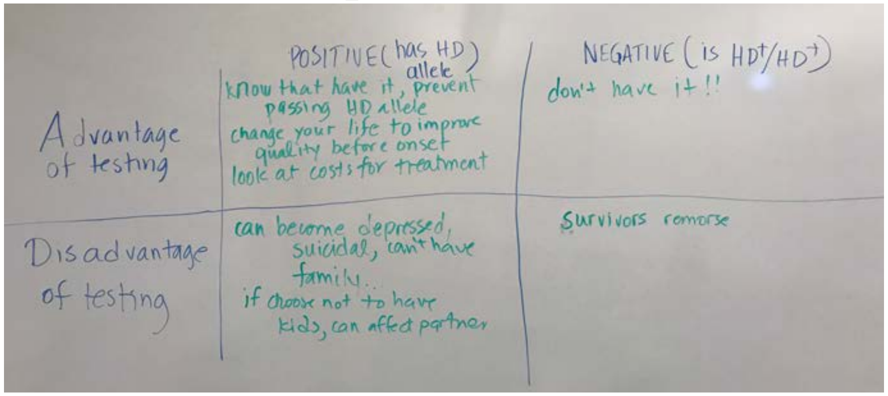
Tuesday, 10/24/17
HH 543, 2:10pm

http://biology.sfsu.edu/content/EEC

Rachel Adams
UC Berkeley
Shrooms in rooms: source-sink dynamics in indoor environments

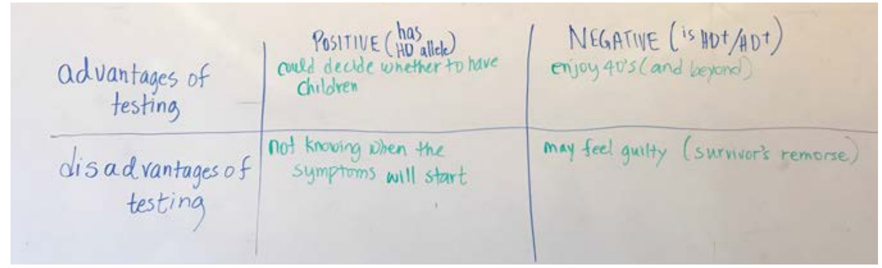
http://plantandmicrobiology.berkeley.edu/profile/radams

Responses Sec 1



NHS
National Genetics Education and Development Centre

Responses Sec 2



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One gene or two…?

- A *Drosophila* lab at SFSU generates a true-breeding wingless fly.

- Another *Drosophila* lab at Stanford generates a true-breeding wingless fly.

- The SFSU wingless fly and the Stanford wingless fly are morphologically identical.

Is the mutation in the SFSU fly in the SAME or DIFFERENT gene as the mutation in the Stanford fly?

SFSU fly

On your own
Clicker Question 1

Stanford fly

Is the mutation in the SFSU fly in the SAME or DIFFERENT gene as the mutation in the Stanford fly?

To determine this, which cross should we perform?

A. Cross the SFSU fly in a testcross
B. Cross the Stanford fly in a testcross
C. Cross the SFSU fly with a wild type fly
D. Cross the Stanford fly with a wild type fly
E. Cross the SFSU fly with the Stanford fly

Ch 4: Gene Interactions
Gene actions are complex

- Pleiotropy: Mutation of one gene may have many effects (phenotypes)
  - The *Drosophila white* mutation affects pigment in the eyes AND other tissues
  - A single allele may be DOMINANT in one tissue but RECESSIVE in another tissue
- The same phenotype may result from the mutations of multiple genes
  - 100 or more genes contribute to pigmentation of the *Drosophila* eye

Complementation - 1

- Wild type flower color is blue
- Treat with radiation and recover 3 white flower
  - Have them as 3 pure-breeding white flower harebell strains
  - $ (dollar)
  - £ (pound)
  - ¥ (yen)

Harebell (*Campanula*) Ch. 4

Complementation - 2

white \$ $\times$ blue $\longrightarrow$ F_1, all blue $\longrightarrow$ F_2, $\frac{3}{4}$ blue, $\frac{1}{4}$ white

white £ $\times$ blue $\longrightarrow$ F_1, all blue $\longrightarrow$ F_2, $\frac{3}{4}$ blue, $\frac{1}{4}$ white

white ¥ $\times$ blue $\longrightarrow$ F_1, all blue $\longrightarrow$ F_2, $\frac{3}{4}$ blue, $\frac{1}{4}$ white

- Cross each white strain with wild type blue
- Each result in the same phenotypes for the F1 and F2
- Is the flower color determined by alleles of the SAME gene or is it due to the action of DIFFERENT genes?

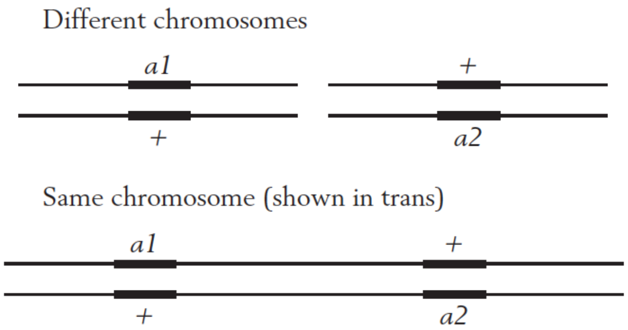
Complementation - 3

- The alleles being analyzed must be recessive for the complementation test to be used.
- If *a′* and *a″* are two variants of the same gene—they are alleles of each other, then…

  - Neither copy of the *a* gene is functional
  - So the mutant phenotype would be observed in all progeny

Complementation - 4

- If *a1* and *a2* are different genes, then



  - $a1^+$ and $a2^+$ are functional copies
  - All of the progeny should show the WILD TYPE phenotype

Complementation - 5

- Here are the results of crossing the white mutants

$$\text{white } \$ \times \text{ white } £ \longrightarrow F_1\text{, all white}$$
$$\text{white } \$ \times \text{ white } ¥ \longrightarrow F_1\text{, all blue}$$
$$\text{white } £ \times \text{ white } ¥ \longrightarrow F_1\text{, all blue}$$

Clicker Question (not asked, but discussed!)

- Here are the results of crossing the white mutants

$$\text{white } \$ \times \text{ white } £ \longrightarrow F_1\text{, all white}$$
$$\text{white } \$ \times \text{ white } ¥ \longrightarrow F_1\text{, all blue}$$
$$\text{white } £ \times \text{ white } ¥ \longrightarrow F_1\text{, all blue}$$

Which of the following conclusions is based on the data?

A. White $ and White £ are allelic (variants of the same gene)

B. White $ and White ¥ are allelic (variants of the same gene)

C. White £ and White ¥ are allelic (variants of the same gene)

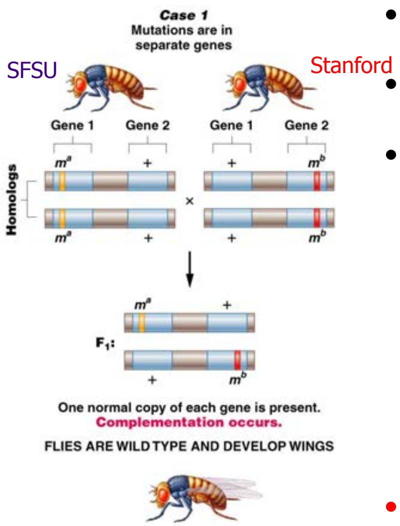
Complementation - 6

- Here are the results of crossing the white mutants

$$\text{white } \$ \times \text{ white } £ \longrightarrow F_1\text{, all white}$$
$$\text{white } \$ \times \text{ white } ¥ \longrightarrow F_1\text{, all blue}$$
$$\text{white } £ \times \text{ white } ¥ \longrightarrow F_1\text{, all blue}$$

- NO complementation - White $ and white £ are in same complementation group.
- Complementation - White $ and white ¥ are in different complementation groups.
- Complementation - White £ and white ¥ are in different complementation groups.

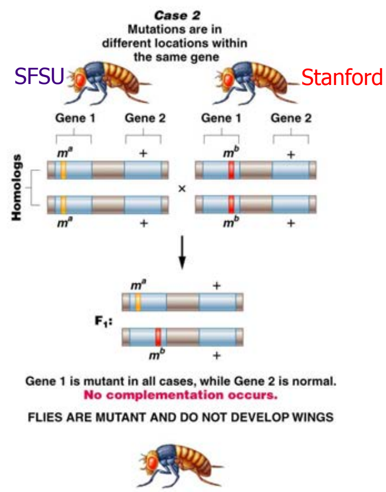
If the mutations are in DIFFERENT genes



- SFSU fly has mutation m^a in Gene 1
- Stanford fly has mutation m^b in Gene 2
- F1 fly has
  - one homolog with m^a in Gene 1, and has a wt copy of Gene 2
  - other homolog with m^b in Gene 2, and has a wt copy of Gene 1
  - Complementation occurs
  - F1 flies are wild type and develop wings
- IMPORTANT - this works with recessive alleles only

Klug *et al.*, 10th edition, Figure 4.11

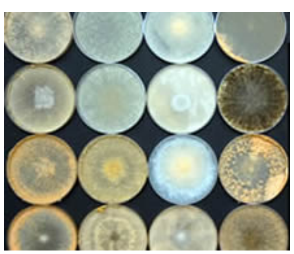
If the mutations are in the SAME gene (different locations within gene)

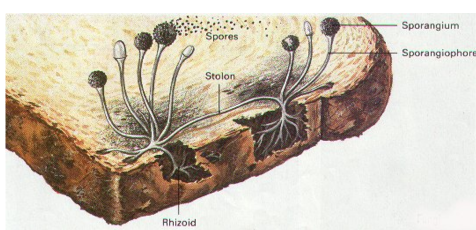


- SFSU fly has mutation m^a in Gene 1
- Stanford fly has mutation m^b in Gene 1
- F1 fly has one homolog with m^a and other homolog with m^b
  - No functional Gene 1
  - No wings
  - No complementation
- NOTE: the SFSU fly and the Stanford fly are in the same complementation group

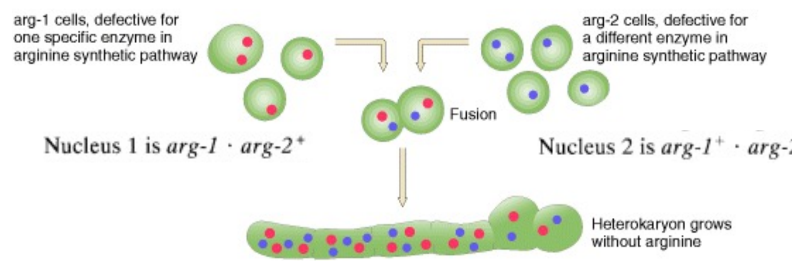
Klug *et al.*, 10th edition, Figure 4.11

Neurospora crassa, orange bread mold





Complementation test in the haploid *N. crassa*



- The fusion of *arg-1* and *arg-2* fungal cells, or heterokaryon, results in complementation
- The heterokaryon will grow in the absence of arginine

Figure 4-2