Genetic analysis - I

Genetics 371B Lecture 25 15 Nov. 1999

The goal: understanding a biological process

The approach: break the system one component at a time; ask how it's broken (phenotype)

The tools

- Mutations

- Recombination

"Breaking" the system – mutagenesis of a large population

- few (usually, ≤ 1) mutations per individual
- for each gene, at least a few individuals (in the population) who have a mutation in that gene

Mutagenesis:

Screen vs. **selection** – identifying the mutants you are interested in

- Screen –
- Selection –

Examples

- The interview – finding a translator
  - Screen
  - Selection

- Fly, fly away – wingless fly mutants
  - Screen
  - Selection

Bacterial transformation to antibiotic resistance – selection or screen?

Vogelstein's assay for replication errors – selection or screen?

Determining the number of genes involved in a process...

- **Map** each mutation

- **Complementation** test
  - Do Mutant 1 and Mutant 2 have mutations in the same gene or in different genes?

Example 1 – feather coloring in peacock… suppose you've identified two recessive mutations that cause loss of color (white chickens). Are the mutations in the same gene or in separate genes?

Example 2 – *Drosophila* eye color

To find which mutations are in the same gene vs. different genes…

Make all possible heterozygotes, check phenotypes of females

	white	prune	apricot	buff	cherry	eosin	ruby
white	-	+	-	-	-	-	+
prune	+	-	+	+	+	+	+
apricot	-	+	-	-	-	-	+
buff	-	+	-	-	-	-	+
cherry	-	+	-	-	-	-	+
eosin	-	+	-	-	-	-	+
ruby	+	+	+	+	+	+	-

+ = wildtype, - = mutant

Interpreting the results: **complementation groups** –

Group together those mutations that **fail** to complement **other** mutations

Cautionary notes:

- lethals

- dominant mutations