

BICH/GENE 431 KNOWLEDGE OBJECTIVES

Chapter 22 – Model Organisms

Reasons to use model organisms in molecular genetics research

Bacteria and Bacteriophages (phages)

- advantages: small genomes, single cell, grow fast, facile genetics, can grow large quantities for biochemical experiments
- compare lytic vs. lysogenic phage growth
- What is a phage plaque?

Budding yeast (*Saccharomyces cerevisiae*)

- advantages: simplest eukaryotic model organism, small genome, unicellular, fast generation time, lots of molecular and genetic tools, can grow a lot of cells in order to use for biochemical analyses
- life cycle either haploid or diploid; mating types of haploid
- budding and cell cycle
- relatively easy gene replacement

Nematode worm (*C. elegans*)

- advantages: simplest multicellular model organism, relatively simple body plan, rapid development, lots of progeny
- life cycle
- used to study programmed cell death (apoptosis), RNAi (RNA interference), genes in aging

Fruit fly (*Drosophila melanogaster*)

- advantages: multicellular, many genetic mutants, rapid development, large populations
- life cycle
- basic idea behind P element transformation to make transgenic flies
- used to study embryonic body patterning, growth factor signaling, genetic mapping techniques

Arabidopsis thaliana

- plant model organism
- relative small genome for a plant

Zebrafish

- advantages: simplest vertebrate model organism, one favorite organism for developmental biologists, transparent embryo advantageous to watch development, large number of progeny, relatively fast development

Mouse

- best mammalian model organism
- close synteny between mouse and human chromosomes
- similar physiology and development to humans
- gene knock-out technology
- briefly outline two methods to make transgenic mice: pronuclear injection and homologous recombination into mouse ES (embryonic stem) cells