Genetics module **"Microbial Genetics and Cell Biology"**
WS 2007/2008

Part II (12.11.-30.11.07)
"Yeast genetics and Cell Biology"
Prof. Dr. Jürgen Dohmen

The experimental part of this half of the module focuses on genetic manipulation of the eukaryotic model organism ***Saccharomyces cerevisiae*** (bakers yeast). Molecular biological strategies and techniques that allow the analysis of gene and protein functions will be introduced and applied.

The experiments address the **roles of posttranslational control of protein function by modifications and degradation**. In this context, the role of a small modifier (termed ubiquitin) in mediating degradation by a large ATP-dependent protease (the proteasome) as well in DNA damage repair will be studied. Protein modification by ubiquitin modification ("ubiquitylation) is involved in many processes of eukaryotic cell biology including cell division cycle control, protein quality control, signal transduction, DNA repair, signal transduction, DNS-repair, and endocytosis. In most cases substrate-attached ubiquitin chains serve as signals for degradation by the proteasome.

We will analyze phenotypic effects of mutations affecting the proteasome as well as various enzymes of the ubiquitin system. We will apply methods to detect the metabolic stability of several test substrates in wild-type and mutant cells. We will use genetic experimens to distinguish between substrate-specific ubiquitin-dependent and ubiquitin-independent targeting mechanisms. Another aim of these experiments will be to detect the role of the gene functions under investigation in the recognition of misfolded and abnormal proteins.. Such proteins tend to form intracellular aggregates similar to those that are found in the brains of patients suffering from neurodegenerative diseases such as Alzheimer's disease, Parkinson's disease or Chorea Huntington.

In the theoretical part, we will discuss the background and principles of classical as well as modern techniques available for the study of cell biological processes such as ubiquitin-mediated proteolysis in yeast. Based on this knowledge, we will review outstanding papers, in which utilization of yeast as a model organism has provided major advances in the understanding of important processes of eukaryotic cell biology.

Literature:

(1) Weissman, A. M. (2001). Themes and variations on Ubiquitylation. Nat. Rev. Mol. Cell Biol. 2, 169-178.

(2) Linder, P., Shore, D. (2005). Landmark papers in Yeast Biology. Cold Spring Harbor Laboratory Press (available in the library of the institute for Genetics)

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(Microbial genetics and biotechnology). CH1331.7Complementary course-III. (Bio-organic chemistry).Â Classical experiments proving DNA as the genetic material- transformation experiments,Hershey Chase experiment, Central dogma of molecular biology, Concept of gene- Split genes- introns and exons. C-value paradox. Ref:- Cell and molecular biology- concepts and experiments by Gerald Karp,Wiley 1807-2007, ISBN 978-0-470-16961-2. MODULE II: Replication (10 hours). Replication- Semi conservative replication, Messelson-Stahl experiment. The aim of the â€œMicrobial Genetics and Genomicsâ€ section is to provide a platform for current research on archaea, bacteria, microbial eukaryotes and viruses. We welcome studies that apply recent advances in genetics, genomics, transcriptomics, proteomics, metabolomics and computational biology to provide insights into all aspects of microbiology.Â This includes, but is not limited to, basic microbe biology, virology, microbial ecology and evolution, as well as research focused on the clinical significance and industrial applications of microorganisms. Interdisciplinary studies and novel technological approaches relevant to microbiology are also within the scope of the section. Specialty areas of the scope include, but are not limited to Introduction to Microbial Genetics. Here are suggestions of references you can cite: At the bench : a laboratory navigatorÂ Molecular genetics of bacteria. Calculations for molecular biology and biotechnology (which has information about Cell Growth). Encyclopedias: There are a few encyclopedias in the library on molecular genetics, cell biology or microbiology. For example, the Encyclopedia of microbiology has a section on "Techniques" that includes a chapter on "Recombinant DNA, Basic Procedures". Back to top.