Aims and objectives

- Main aims for six lectures:
  - Give an overview of how bacteria regulate gene expression
  - provide detailed examples of important regulatory systems
  - highlight how current genomic analysis techniques promote understanding of regulation in individual bacteria species.
- Main Objectives for students:
  - to understand the range of strategies used by bacteria to adapt to changing conditions
  - have a detailed knowledge of a set of examples of regulatory systems.
  - to be able to describe how genome analysis methods help elucidate regulatory mechanisms
- www.le.ac.uk/ge/ket/teach/309breg/

How do these lectures fit into BS309?

Module aims:

- To illustrate at advanced level how microbial genetic systems contribute to current understanding of molecular processes involved in the replication, recombination and repair of genomes and their differential expression in response to environmental stimuli.

Student objectives:

- able to:
  - describe in detail selected processes relating to replication, recombination and expression of DNA as studied in yeast and bacteria
  - design experimental strategies to solve problems…
  - research the relevant literature

Adaptive Response Mechanisms

- With examples, will provide a synthesis of material to help understand important strategies in bacterial gene expression
- Put these mechanisms into context
- Bacteria encounter fluctuating environments and use context-dependent regulatory systems to sense, interpret and respond appropriately.
  - change genome organisation
  - change rate of transcription initiation
  - change progression of transcription
  - stop/change translation
  - not describe environmental pressures but the mechanisms used to adapt to environmental change
- Next set of lectures (AMC) will illustrate responses and signal transduction in yeast

Section One: genome changes

Aims:

- show that bacteria use genomic rearrangements to affect gene expression
- provide examples of different strategies and the mechanisms involved in adaptive responses

Student objectives:

- able to give overview of how rearrangements allow bacterial populations to respond to environmental change
- give examples to illustrate mechanisms

Section Two: transcriptional regulation

Aims:

- Major mechanism that bacteria utilise in adaptive responses is transcriptional regulation
- General strategies for transcriptional regulation will be illustrated with two major examples

Student objectives:

- able to describe how bacteria respond to environmental change by regulating transcription
- illustrate mechanisms with examples given in lectures
- through additional study, students should be able to give an overview of other examples

Section Three: post-transcription

Aim:

- Acting after the initiation of transcription, bacteria can also regulate gene expression by premature termination of transcription and the initiation of translation
- Examples of such mechanisms will be described

Student objectives:

- Using examples, students will be able to outline mechanisms to control gene expression following the initiation of transcription

Section Four: functional genomics

Aim:

- Genome sequencing projects give the complete gene complement of a bacterium
- will illustrate how genome sequence data adds to our understanding of adaptive responses
- show how functional genomics will contribute to the investigation of gene regulation

Student objectives:

- expected to describe the strategies available to investigate gene expression on a genome wide basis