

Micro 201
Heller Lecture 2/ Class 26 – The SOS Response
April 27, 2017

Overview:

In today's class we will continue discussing DNA repair mechanisms, focusing on the SOS response. The SOS response is a widely conserved inducible DNA repair network that helps bacteria cope with DNA damage. There are two major players in the SOS response: 1) the transcriptional repressor LexA, which after a DNA damage event, undergoes autocleavage, activating transcription at specific damage-inducible (*din*) loci and 2) RecA, which when bound to single-stranded DNA, activates LexA autocleavage. For an historical overview of this inducible repair network, please make sure you have read through the SOS review (Walker, 2000) from the previous class.

We will be discussing two papers in today's class. The first (Kenyon and Walker, 1980) is a classic paper that describes the discovery and preliminary characterization of the *din* genes, expression of which rescues cells from DNA damage. The second (Cirz et al., 2005) is a more recent paper that describes how induction of the SOS response during antibiotic treatment can allow cells to acquire resistance-conferring mutations. I think this paper is nice as it introduces many of the mechanisms involved both upstream and downstream of LexA autocleavage (without going into excessive detail), and their findings have important implications for how we approach the treatment of bacterial infections.

Discussion papers

1. Kenyon CJ, Walker GC. DNA-damaging agents stimulate gene expression at specific loci in *Escherichia coli*. *Proceedings of the National Academy of Sciences*. National Acad Sciences; 1980 May 1;77(5):2819–23.
2. Cirz RT, Chin JK, Andes DR, de Crécy-Lagard V, Craig WA, Romesberg FE. Inhibition of Mutation and Combating the Evolution of Antibiotic Resistance. Waldor M, editor. *PLoS Biol*. 2005 May 10;3(6):e176–10.

Background reading

3. Walker GC. Understanding the Complexity of an Organism's Responses to DNA Damage. *Cold Spring Harb Symp Quant Biol*. Cold Spring Harbor Laboratory Press; 2000 Jan 1;65(0):1–10.