

Induction and mechanisms of specific DNA repair pathways.

Cellular responses to potentially mutagenic damage include:

I. Enzymatic inactivation of agents before they do damage--superoxide dismutases, catalases, peroxidases

II. Proofreading during replication--3' to 5' exonuclease activity

III. Post-replication repair pathways

A. Direct reversal of specific DNA lesions - photolyase

B. Excision repair: nucleotide and base excision pathways

1. Induced by mismatch--dam methylase dependent mismatch correction

a. initiation of methyl-directed reaction: mutS, mutL, mutH

- i. Recognition by mutS
- ii. Incision by mutH

b. excision and repair involves at least seven activities: DNA helicase II (=mutU or uvrD), SSB, exo I, exoVII, RecJ exo, DNAP III, DNA ligase

2. Induced by modified, unnatural, or mismatched base pairs-base excision

a. DNA N-glycosylases

b. AP endonucleases

3. Induced by distortion in double helix-nucleotide excision

a. initiation (recognition and incision): uvrABC

b. excision and repair: uvrD, DNAP I, DNA ligase

C. Recombinational repair--induced by absence of a complementary template, e.g. double-stranded break, recABCD repair

D. Bypass repair--induced by damage severe enough to stop replication

1. umuC, D mediated error prone repair - "mutase"

2. SOS response

IV. Apoptosis - cellular suicide (Watson, p. 698)

Readings:

Watson, Chapter 9, pp 235-257