ioral circumstances. Even so, the existence of such precise segregation of spatiotemporal firing along both contextual and behavioral dimensions makes it likely that this principle of information representation may be present in other brain regions.

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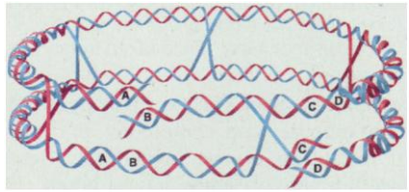
Resistance to Radiation

Michael J. Daly and Kenneth W. Minton

A human exposed to less than 5 Gy (1 Gy = 100 rad) of ionizing radiation would suffer almost certain death. Measured against this degree of radiation resistance, the bacterium *Deinococcus radiodurans* is truly remarkable, capable of surviving 5000 to 30,000 Gy of ionizing radiation (*1*). Such a dose will shatter the organism's chromosomes into hundreds of fragments, yet *D. radiodurans* possesses an extraordinary ability to recover, owing to its supremely efficient DNA repair machinery. The cell's powerful repair system can assemble intact chromosomes from the hundreds of fragments remaining after a 10,000-Gy dose. In as little as 12 to 24 hours, a *recA*-dependent recombinational pathway restores the chromosomes without lethality or mutagenesis (*2*).



Hypothetical double chromosome structure showing double-strand DNA breaks (at loci A-B and C-D) held in alignment by virtue of persistent Holliday junctions.

How is this possible? It might be because a chromosomal fragment can always find an intact homologous neighbor to serve as a repair template. In *D. radiodurans*, chromosomes may exist in pairs that are aligned relative to one another by Holliday junctions (*3*). Thus, a radiation-induced chromosome double-strand break would not be lethal, because an identical undamaged DNA duplex is available nearby (see figure).

Why does this extreme radiation resistance exist? Such high radiation fluxes have never occurred in the natural world, even in the early days of Earth's formation. But another stress—dehydration—afflicts *D. radiodurans* and also causes massive DNA fragmentation in this nonsporulating organism. The radiation resistance of *D. radiodurans* may be a serendipitous result of its ability to repair its DNA after severe dehydration (*4*). Thus, the efficient repair system might be best thought of as a mechanism to heal DNA fragmentation, whatever its cause.

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