ERCC5 (xeroderma pigmentosum, complementation group G)

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Identity

Other names: XPG (xeroderma pigmentosum, complementation group G); ERCC5
HGNC (Hugo): ERCC5
Location: 13q32-33

DNA/RNA

Description
30 kb; 15 exons (from 61 to 1074 bp) and 14 introns (250 to 5763 bp).

Transcription
15 exons.
Six spliced XPG mRNA isoforms retaining alternatively spliced exons (I,III), full intron retentions (II, VI), partial intron retention (V) and partial exon skipping (IV).

Protein

Description
Xeroderma pigmentosum group G complementing factor; DNA-repair protein complementing XPG cells.

Function

The XPG protein has DNA endonuclease activity without preference for damaged DNA and is responsible for the 3' incision made during Nucleotide Excision Repair (NER). At the site of a lesion NER proteins create a DNA bubble structure over a length of approximately 25 nucleotides and the XPG protein incises the damaged DNA strand 0-2 nucleotides 3' to the ssDNA-dsDNA junction. In most studies the 3'-incision made by the XPG protein appeared to be performed prior to and independently of the 5'-incision by XPF-ERCC1. The XPG protein is required non-enzymatically for subsequent 5= D5 incision by the XPF/ERCC1 heterodimer during the NER process. Patients belonging to the XP-G complementation group clinically exhibit heterogeneous symptoms, from mild to very severe, sometimes associated with CS. XP-G cells are almost completely repair-deficient and as UV-sensitive as XP-A cells. About half of the described XPG patients exhibit also CS symptoms. In that case, the XPG protein is also involved in the transcription-coupled repair of oxidative DNA lesions.

Homology

Extensive sequence similarities, in bipartite domain A and B, to products of RAD repair genes of two yeasts, Saccharomyces cerevisae and Schizosaccharomyces pombe RAD2 and RAD13.

Mutations

Germinal

5 XPG sequence alterations: 3 point mutations and two small deletions.
Implicated in
Xeroderma pigmentosum, XP group G/cockayne=D5s syndrome, XP/CS

Disease
Early skin tumours.

References


Okuno Y, Tateishi S, Yamaizumi M. Complementation of xeroderma pigmentosum cells by microinjection of mRNA fractionated under denaturing conditions: an estimation of sizes of XP-E and XP-G mRNA. Mutat Res. 1994 Jan;314(1):11-9


Shiomi T, Harada Y, Saito T, Shiomi N, Okuno Y, Yamaizumi M. An ERCC5 gene with homology to yeast RAD2 is involved in group G xeroderma pigmentosum. Mutat Res. 1994 Mar;312(2):167-75


Cloud KG, Shen B, Strniste GF, Park MS. XPG protein has a structure-specific endonuclease activity. Mutat Res. 1995 Jul;347(2):55-60


Knauf JA, Pendergrass SH, Marrone BL, Strniste GF, MacInnes MA, Park MS. Multiple nuclear localization signals in XPG nucleosome. Mutat Res. 1996 May 15;363(1):67-75


Cooper PK, Nouspikel T, Clarkson SG, Leadon SA. Defective transcription-coupled repair of oxidative base damage in Cockayne syndrome patients from XP group G. Science. 1997 Feb 14;273(5290):990-3

Evans E, Fellows J, Coffer A, Wood RD. Open complex formation around a lesion during nucleotide excision repair
provides a structure for cleavage by human XPG protein. EMBO J. 1997 Feb 3;16(3):625-38
Nouspikel T, Lalle P, Leadon SA, Cooper PK, Clarkson SG. A common mutational pattern in Cockayne syndrome patients from xeroderma pigmentosum group G: implications for a second XPG function. Proc Natl Acad Sci U S A. 1997 Apr 1;94(7):3116-21
Cailleja FM, Nivard MJ, Eeken JC. Induced mutagenic effects in the nucleotide excision repair deficient Drosophila mutant mus201(D1), expressing a truncated XPG protein. Mutat Res. 2001 Jan 5;461(4):279-88
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