WIKIPEDIA

*Eco*RI

***Eco*RI** (pronounced "eco R one") is a restriction endonuclease enzyme isolated from species *E. coli*. The *Eco* part of the enzyme's name originates from the species from which it was isolated, while the R represents the particular strain, in this case RY13. The last part of its name, the I, denotes that it was the first enzyme isolated from this strain. *Eco*RI is a restriction enzyme that cleaves DNA double helices into fragments at specific sites. It is also a part of the restriction modification system.

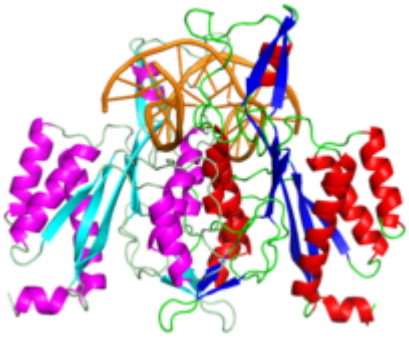
In molecular biology it is used as a restriction enzyme. *Eco*RI creates 4 nucleotide sticky ends with 5' end overhangs of AATT. The nucleic acid recognition sequence where the enzyme cuts is G/AATTC, which has a palindromic, complementary sequence of CTTAA/G. The / in the sequence indicates which phosphodiester bond the enzyme will break in the DNA molecule. Other restriction enzymes, depending on their cut sites, can also leave 3' overhangs or blunt ends with no overhangs.

Contents

Structure

Primary structure

*Eco*RI contains the PD..D/EXK motif within its active site like

***Eco*RI**	
 *Eco*RI crystal structure. Dimer bound to DNA (PDB 1ckq) (https://www.ebi.ac.uk/pdbe/entry/pdb/1ckq))	
Identifiers	
Symbol	*Eco*RI
Pfam	PF02963 (http://pfam.xfam.org/family?acc=PF02963)
InterPro	IPR004221 (https://www.ebi.ac.uk/interpro/entry/IPR004221)
SCOPe	1na6 (https://scop.berkeley.edu/search/key=1na6) / SUPFAM (http://supfam.org/SUPERFAMILY/cgi-bin/search.cgi?search_field=1na6)
CDD	79lll (https://www.ncbi.nlm.nih.gov/Structure/cdd/cddsrv.cgi?uid=79lll)
Available protein structures:	

many restriction endonucleases.

Pfam	structures (http://pfam.xfam.org/family/PF02963?tab=pdbBlock) / ECOD (http://prodata.swmed.edu/ecod/complete/search?kw=PF02963)
PDB	RCSB PDB (http://www.rcsb.org/pdb/search/smartSubquery.do?smartSearchSubtype=PfamIdQuery&pfamID=PF02963); PDBe (https://www.ebi.ac.uk/pdbe/entry/search/index?pfam_accession:PF02963); PDBj (https://pdbj.org/searchFor?query=PF02963)
PDBsum	structure summary (https://www.ebi.ac.uk/thornton-srv/databases/cgi-bin/pdbsum/GetPfamStr.pl?pfam_id=PF02963)

Tertiary and quaternary structure

The enzyme is a homodimer of a 31 kilodalton subunit consisting of one globular domain of the α/β architecture. Each subunit contains a loop which sticks out from the globular domain and wraps around the DNA when bound.[1][2]

*Eco*RI has been cocrystallized with the sequence it normally cuts. This crystal was used to solve the structure of the complex 1QPS (https://www.rcsb.org/structure/1QPS). The solved crystal structure shows that the subunits of the enzyme homodimer interact with the DNA symmetrically.[1] In the complex, two α-helices from each subunit come together to form a four-helix bundle.[3] On the interacting helices are residues Glu144 and Arg145, which interact together, forming a crosstalk ring that is believed to allow the enzyme's two active sites to communicate.[4]

Uses

*Eco*RI recognition site with cutting pattern indicated by a green line

Restriction enzymes, such as *Eco*RI, are used in a wide variety of molecular genetics techniques including cloning, DNA screening and deleting sections of DNA *in vitro*. Restriction enzymes, like *Eco*RI, that generate sticky ends of DNA are often used to cut DNA prior to ligation, as the sticky ends make the ligation reaction more efficient. *Eco*RI can exhibit non-site-specific cutting, known as star activity, depending on the conditions present in the reaction. Conditions that can induce star activity when using *Eco*RI include low salt concentration, high glycerol concentration, excessive amounts of enzyme present in the reaction, high pH and contamination with certain organic solvents. The cut made by the Eco RI enzyme produces sticky ends on the vector mainly plasmids or viral DNA's.[5]

See also

- EcoRII, another nuclease enzyme from *E. coli*.
- EcoRV, another nuclease enzyme from *E. coli*.

References

1. Pingoud A, Jeltsch A (September 2001). "Structure and function of type II restriction endonucleases" (https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5591

6). *Nucleic Acids Research*. **29** (18): 3705–27. doi:10.1093/nar/29.18.3705 (https://doi.org/10.1093%2Fnar%2F29.18.3705). PMC 55916 (https://www.ncbi.nlm.nih.gov/pmc/articles/PMC55916). PMID 11557805 (https://pubmed.ncbi.nlm.nih.gov/11557805).

2. Kurpiewski MR, Engler LE, Wozniak LA, Kobylanska A, Koziolkiewicz M, Stec WJ, Jen-Jacobson L (October 2004). "Mechanisms of coupling between DNA recognition specificity and catalysis in EcoRI endonuclease". *Structure*. **12** (10): 1775–88. doi:10.1016/j.str.2004.07.016 (https://doi.org/10.1016%2Fj.str.2004.07.016). PMID 15458627 (https://pubmed.ncbi.nlm.nih.gov/15458627).
3. Bitinaite J, Wah DA, Aggarwal AK, Schildkraut I (September 1998). "FokI dimerization is required for DNA cleavage" (https://www.ncbi.nlm.nih.gov/pmc/articles/PMC27935). *Proceedings of the National Academy of Sciences of the United States of America*. **95** (18): 10570–5. Bibcode:1998PNAS...9510570B (https://ui.adsabs.harvard.edu/abs/1998PNAS...9510570B). doi:10.1073/pnas.95.18.10570 (https://doi.org/10.1073%2Fpnas.95.18.10570). PMC 27935 (https://www.ncbi.nlm.nih.gov/pmc/articles/PMC27935). PMID 9724744 (https://pubmed.ncbi.nlm.nih.gov/9724744).
4. Kim YC, Grable JC, Love R, Greene PJ, Rosenberg JM (September 1990). "Refinement of Eco RI endonuclease crystal structure: a revised protein chain tracing" (https://doi.org/10.1126/science.2399465). *Science*. **249** (4974): 1307–9. Bibcode:1990Sci...249.1307K (https://ui.adsabs.harvard.edu/abs/1990Sci...249.1307K). doi:10.1126/science.2399465 (https://doi.org/10.1126%2Fscience.2399465). PMID 2399465 (https://pubmed.ncbi.nlm.nih.gov/2399465).
5. "Archived copy" (https://web.archive.org/web/20121015114846/http://www.neb.com/nebecomm/products/faqproductR0101.asp#1). Archived from the original (http://www.neb.com/nebecomm/products/faqproductR0101.asp#1) on 2012-10-15. Retrieved 2010-01-21.

External links

- Eco-RI (https://meshb.nlm.nih.gov/record/ui?name=Eco-RI) at the US National Library of Medicine Medical Subject Headings (MeSH)
- Overview of all the structural information available in the PDB for UniProt: *P00642 (https://www.ebi.ac.uk/pdbe/pdbe-kb/proteins/P00642)* (Type-2 restriction enzyme EcoRI) at the PDBe-KB.