

Star Activity of Restriction Enzymes

Some restriction enzymes may cleave different base sequence than their recognition sequence, under sub-optimal reaction conditions. These conditions generally include high salt concentrations, impure templates, or a large excess of enzyme compared to substrate DNA. This reduced specificity is called star activity. The table below lists enzymes for which star activity may be observed together with the experimental conditions required to induce star activity. The alternative base sequences cleaved are noted where these data are available.

Restriction Enzyme	Normal recognition Sequence	Reaction conditions*	Recognition Sequence**	Reference
<i>Aat</i> II	GACGT C	D		22
<i>Aor</i> 13H I	T CCGGA	A, C, D		22
<i>Ava</i> I	C YCGRG	A, D		1
<i>Ava</i> II	G GWCC	A, D		22
<i>Avi</i> II	TGC GCA	C, D		22
<i>Bam</i> H I	G GATCC	A, B, D, E	GRATCC GGNTCC GGATYC	1,2,3,4
<i>Ban</i> II	GRGCT C	A, D, E		22
<i>Bgl</i> I	GCCNNNN NGGC	E		22
<i>Bgl</i> II	A GATCT	D		22
<i>Bsp</i> T104 I	TT CGAA	A, D		22
<i>Bst</i> P I	G GTNACC	A, E		22
<i>Bst</i> 107 I	GTA TAC	E		22
<i>Eam</i> 1105 I	GACNNN NNGTC	A, C, E		22
<i>Eco</i> 065 I	G GTNACC	D, E		22
<i>Eco</i> R I	G AATTC	A, B, D, E	NAATTN GNTATC GANATC GATNTC GATANC GATATY	4,8,9,10,11 12,22
<i>Eco</i> R V	GTA ATC	D		
<i>Eco</i> T22 I	ATGCA T	E, G		22
<i>Fba</i> I	T GATCA	A, C, D, E		22
<i>Hae</i> III	GG CC	A		1
<i>Hha</i> I	GCG C	A, D		4
<i>Hinc</i> II	GTY RAC	D		22
<i>Hind</i> III	A AGCTT	B, D	RAGCTT ANGCTT AAKCTT AAGMTT AAGCNT AAGCTY	10,13,22
<i>Hpa</i> I	GTT AAC	A, D		1,22
<i>Kpn</i> I	GGTAC C	D		22
<i>Mun</i> I	C AATGG	A, E		22
<i>Nco</i> I	C CATGG	A, D		22
<i>Nhe</i> I	G CTAGC	A, C, D, E		22
<i>Psp</i> 1406 I	AA CGTT	D		22
<i>Pst</i> I	CTGCA G	A, D		1,4,22

Restriction Enzyme	Normal recognition Sequence	Reaction conditions*	Recognition Sequence**	Reference
<i>Pvu</i> II	CAG CTG	A, D	NAGCTG CNGCTG CANCTG CAGNTG CAGCNG CAGCTN	15,16,22
<i>Sac</i> I	GAGCT C	A D		22
<i>Sal</i> I	G TCGAC	A, D		4,22
<i>Sau</i> 3A I	GATC	A, D	SATC GMTC GAKC GATS	17,22
<i>Sca</i> I	AGT ACT	B, C, E		21
<i>Sfi</i> I	GCCNNNN NGGCC	B, D		22
<i>Spe</i> I	A CTAGT	D, E		22
<i>Sse</i> 387 I	CCTGCA GG	D, E		22
<i>Ssp</i> I	AAT ATT	A, C, D, E		22
<i>Swa</i> I	ATTT AAAT	D, E		22
<i>Tth</i> HB8 I	T CGA	C, D, E		22
<i>Tth</i> 11 I	GACN NNGTC	B, C, F	NACNNNGTC GNCNNNGTC GANNNGTC GACNNNNTC GACNNNGNC GACNNNGTN	19
<i>Van</i> 9 I	CCANNNN NTGG	A		22
<i>Vpa</i> k11B I	G GWCC	A, C, D, E		22
<i>Xba</i> I	T CTAGA	A, D		1,4

References

- Nath, K. and Azzolina, B. A. (1981) *Gene Amplif. Anal.* **1**:113-30.
- George, J., *et al.* (1980) *J. Biol. Chem.* **255**:6521-4.
- George, J. and Chirikjian, J.G. (1982) *Proc. Natl. Acad. Sci. USA* **79**:2432-6.
- Malyguine, E. *et al.* (1980) *Gene* **8**:163-77.
- Clarke, C.M. and Hartley, B.S. (1979) *Biochem. J.* **177**:49-62.
- Heininger, K. *et al.* (1977) *Gene* **1**:291-303.
- Makula, R.A. and Meagher, R.B. (1980) *Nucl. Acids Res.* **8**:3125-31.
- Polisky, B. *et al.* (1975) *Proc. Natl. Acad. Sci. USA* **72**:3310-4.
- Tikhonenko, T.I. *et al.* (1978) *Gene* **4**:195-212.
- Hsu, M. and Berg, P. (1978) *Biochemistry* **17**:131-8.
- Woodbury, C.P. *et al.* (1980) *J. Biol. Chem.* **255**:11534-46.
- Halford, S.E. *et al.* (1986) *Gene* **41**:173-81.
- Nasri, M. and Thomas, D. (1986) *Nucl. Acids Res.* **14**:811-22.
- Gingeras, T.R. and Brooks, J.E. (1983) *Proc. Natl. Acad. Sci. USA* **80**:402-6.
- Nasri, M. *et al.* (1985) *FEBS Lett.* **185**:101-4.
- Nasri, M. and Thomas, D. (1987) *Nucl. Acids Res.* **15**:7677-87.
- Pech, M. *et al.* (1979) *Cell* **18**:883-93.
- Barany, F. (1988) *Gene* **65**:149-65.
- Shinomiya, T. *et al.* (1982) *J. Biochem.* **92**:1823-32.
- Kessler, C., unpublished observations.
- Grosskopt, R. and Kessler, C., unpublished observations.
- Takara Shuzo Co., Ltd., unpublished observations.

* Reaction Conditions

A: high levels of glycerol; B: in the presence of Mn²⁺; C: alkaline pH; D: in the presence of DMSO; E: low ionic strength; F: high ionic strength; G: in the presence of 2-mercaptoethanol

** Key

M = A or C; K = G or T; N = A, C, G, or T;
R = A or G; Y = C or T; W = A or T; S = G or C