

PBP-3

PBP-3_ftsI_PA4418

CTX-M_AB177384

PSE-1_J05162

SVH-1_X98099

TEM-1_NC_013120

Class A β -lactamase

conserved key motif

indicates positions which have a single, fully conserved residue

```

200 ---GRVIK--DVQVTKNAKPGKTLALSIDLRLQYLAHR-----ELRNALLENGAKAG 246
1 ----MVKSLRQFTLM---ATATVTLLLGSVPLYAQT---ADVQQKLAELERQSGGRLG 49
1 MLLYKMCDNQNYGVTYM---KFLLAFSLLIPSVVFASSSKFQQVEQDKAIEVSLSARIG 57
1 -----MRYIRLCII---SLLA---TLPLAVHASPQPL----EQIKLSESQLSGRVG 41
1 -----MSIQHFRVALI---PFFA---AFCLPVFAHHPETL----VKVKDAEDQLGARVG 43

247 SLVIMDVKTGEILAMTNQPTYNPNRRRNLQPAAMRNRAMIDVFEPGS**KSTVKPFMSAALA- 305
50 -VALINTADNSQ-I-----LYRADERFAM-----CSTSKVMAAAAAVLLKK 86
58 -VSVLDTQNGEY-W-----DYNGNQRFFPL-----TSTFKTIACAKLLYLD 94
42 -MIEMDLASGRTLT----AWRADERFFPM-----MSTFKVVLLCGAVLAR 79
44 -YIELDLNSGKILE-----SFRPEERFPM-----MSTFKVVLLCGAVLSR 81

306 -----SGRWKPSDIVDVYPGTLQI--GRYTIRDVSRNSRQLDLTGILIKSSNVGI 353
87 SESEPNLLNQRVEIKKSDLVNYNPIAEKHVDGTMSLAELSA-----AALQYSDNVAM 138
95 AEQGVNPNSTVEIKKADLVTYSPVIEKQVQQAITLDDACF-----ATMTTSDNTA 146
80 VDAGDEQLERKIHYRQDLVDYSPVSEKHLADGMTVGELCA-----AAITMSDNSAA 131
82 VDAGQEQLGRRIHYSNDLVEYSPVTEKHLTDGMTVRELCS-----AAITMSDNTA 133

354 SKIAFDIGA-ESIYSVMQVGLGQ-----DTGLGFPGERVGNLPNHRKWPKAETATL 404
139 NKLISHVGGPASVTAFARQLGDETFRLDRTEPTLNTAIPGDP-----RDTTSPRAMAQTL 193
147 NIILSAVGGPKGVTDFLRQIGDKETRLDRIEPDLNEGLKGDL-----RDTTTPKAIASTL 201
132 NLLLATVGGPAGLTAFLRQIGDNVTRLDRWETELNEALPGDA-----RDTTTPASMAATL 186
134 NLLLTTIGGPKELTAFLHNMGDHVTRLDRWEPELNEAIPNDE-----RDTTMPAAMATTL 188

405 ---AYGYLSVTAIQLAHAYAALANDGKSVPLSMTRVDRVPDGVQVISPEVASTVQGMLQ 461
194 RNLTLGKALGDS-----QRAQLVTWMKGNTT----- 219
202 NKFLFGSALSEM-----NQKLLESWMVNNQV----- 227
187 RKLLTSQRLSAR-----SQRQLLQWMVDDRV----- 212
189 RKLLTGELLTLA-----SRQQLIDWMEADKV----- 214

462 QVVEAQGGVFRAQVP-GYHAAGKSGTARKVSVGTKGYRENAYRSLFAGFAPATDPRIAMV 520
220 ----GAASIQAGLPASWVVGDKTGSGDY-----GTTNDIAVIWPKDRAPLILV 263
228 ----TGNLLRSVLPAGWNIADRSGAGGF-----GARSITAVVWSEHQAPIIVS 271
213 ----AGPLIRSVLPAGWFIADKTGAGER-----GARGIVALLGPNNAERIIVV 256
215 ----AGPLLRSALPAGWFIADKSGAGER-----GSRGITAALALGPDGKPSRIIVV 258

521 VVIDEP-SKAGYFGG-LV-SAPVFSKVMAGALRLMNVPPDNLPTATEQQQVNAAPAKGGRG 578
264 TYFTQPQPKAESRRDLASAAKIVTNG-L----- 291
272 IYLAQTQASMEERNDAIVKIGHSIFDV-YTSQSR----- 304
257 IYLRDTPASMAERNQIAGIGAALIEH-WQR----- 286
259 IYTTGSQATMDERNRQIAEIGASLIKH-W----- 286

```

Supplemental Fig. 1. The similarities in the structures of class A β -lactamases and penicillin-binding protein (PBP)

The enzyme active site motifs S-X-X-K, S-X-N, and K-S/T-G in the primary sequence of class A β -lactamases also exist in PBP3. Based on the primary sequences, the alignment was generated using Clustal Omega [32, 33, 34] of GenomeNet at Kyoto University Bioinformatics Center (<https://www.genome.jp/tools-bin/clustalw>).