

Supplementary Data Files (Three)

Title: Molecular evolutionary analysis of the widespread *piggyBac* transposon family and related domesticated genes

Authors: Abhimanyu Sarkar, Cheolho Sim, Young S. Hong, James R. Hogan, Malcolm J. Fraser, Hugh M. Robertson, and Frank H. Collins

Supplementary Data File 1. Amino acid FASTA file of 50 *piggyBac* –like sequences.

Supplementary Data File 2. CLUSTAL alignment file of amino acid sequences of 50 *piggyBac* –like sequences.

Supplementary Data File 3. NEXUS/PAUP file of amino acid sequences of the 50 *piggyBac* –like sequences used for phylogenetic analyses.

Supplementary Data File 1. Amino acid FASTA file of 50 *piggyBac* –like sequences.

>TniPB

MGSSLDDEHILSALLQSDDELVGEDSDSEISDHVSEDDVQSDTEEFIDEVHEVQPTSSGSEILDEQNVI EQPGSSLASN
RILTLPQRTIRGKNKHCWSTSKSTRRSVSALNIVRSQRGPTRMCRNIYDPLLCKFLFFTDEI I SEIVKWTNAEISLKRR
ESMTGATFRDTNEDEIYAFFGILVMTAVRKDNHMSTDDLFDRLSMVYVSVMSRDRDFDLIRCLRMDDKSIRPTLRENDV
FTPVRKIWDLFIHQCIQNYTPGAHLTIDEQLLGFRGRCPFRMYIPNKPSKYGIKILMMCDSGTKYMINGMPYLGRGTQTN
GVPLGEYYVKELSKPVHGSCRNITCDNWFTS I PLAKNLLQEPYKLTIVGTVRSNKREIPEVLKNSRSRVPVGTSMFCFDGP
LTLVSYKPKPAKMVYLLSSCDEDASINESTGKQPMVMYYNQTKGGVDTLDQMCSVMTC SRKTNRWPMALLYGMINIACIN
SFI IYSHNVSSKGEKVQSRKKFMRNLYMSLTSSFMKRLEAPTLKRYLRDNI SNILPNEVPGTSDSTEEPVMKKRTYCT
YCPSKIRKANASCCKKCKKVICREHNIDMCQSCF

>BdoPB

STRRSVSALNIVRSQRGPTRMCRNIYDPLLCKFLFFTDEI I SEIVKWTNAEISLKRRSMTGATFRDTNEDEIHALFGI
LVMTAVRKDNHMSTDDLIDRSLSMVYVSVMSRDRDFDLIRCLRMDDKSIRPTLRGNDVFTPVVRKIWDLFIHQCIHNYTPG
AHLTIDEQLLGFRGRCPFRMYIPNKPSKYGIKILMMCDSGTKYMINGMPYLERGTQNGVPLGEYYVKELSKPVHGSCRN
ITCENWFTS I PLAKNLLQEPYKLTIVGTVRSNKREIPEVLKNSRSRVPVGTMPMFCFDGPLTLVSYKPKPAKMVYLLSSCDE
DASINESTGKQPMIMYYNQTKGGVDTLDQMCSVMCSRKTNRWPMALLYGMINIACINSFI IYSHNVSSKGEKVQSRKNF
MKNLNMSLTSSFMKRLEAPTLKRYLRDNI SNILPNEVPGTSEDSTEEPVTKKRTYCTYCPKIRRKATASCCKKCKKVIC
REHNIDICQSCF

>AgaPB1

MFISDKESTCQGPGRKHTYVADIGTGPSKETCRASSTRQATDSNAGRTPRVVPKSKKDQVDIQSKEAAKTNRRTLEGLG
KLAVGSVVEAPDGTQWKVVEVNNANGGIVAEVNVIRDVPGPSAYAKRYVAVAGAVSSSWRLIIDNGILNQIRKCTEIEARR
VLQTKNWTLSFAELEAFLAILYIRGATESKGMIDLMWSEKYGLPFCKNVMSRNRFREIMKFLRFDEKSTRSQRLQTDKF
ALISDVFSRFVSNQNTNYVPGPHISVDEQLFPSKTRCPFTQFMASKPDKYGQKYWMAVDVDSKYVVNIIPYLGKNDERPA
EERLGDVFKLVDPYLNRRNVTCDNFFTSLELAKFLSKKTSLVGTINKARREVPICVKKVEKLYFTKAFKSDDTTL
TVYQKTKKNVLLSSMHRDIRTGNDDKSKPETVAFYNSTKYGVDVVDQMCRKYSLSASRRWSVHSFFNILDLGINAW
VLYKELTKENISRRDFLFLKGEELAEYVENKSANANLPMTNAGGSRRRYKVQTSCHEGKSANECFTCNRPVCKKCTKRI
SYVCVSCPEGSDEAM

>AgaPB2

MTDIEWLELSPAELSDADKLNRYQKILDELTEQVVGYLEEDDIASIANFDDSDVEDIEIPODYDETDDEDFDEEYE
LENAPESYTARDGTIWTTPPLRKILMHNVIKDNLASHLKNKSDKSAVDIFKLFFSTPICEIIVIRETNRKADQFCAN
YNASHPDSNIQWQPLTPSELDAYIGILIEAGVTHSNLDLAEELWKTNSHPLFRASMLGRFISITRFIRFDNGSTREQRK
KTDKAAASQIFGILNTNLNSCYKPRNNLTIDEQLFPYRGGTGFTQYIPSKPAKYGIKIWWICDSESSYPLKGQIYTGLS
PSGEREKNQGERVVKDLCHQFRRSGRNIITCDNFFTTFNLAKTLMQDYKLSILGTVNKRRTFVPFELMVTKGRETSTKFFV
FQNNVTMCSYIPKKNRSVLLISTSHYDTKTHGPKKPTMMLDYNKYKGGVDTMDQCLAHFTTKRKRTRWPLAFFYNILDI
AAYAAYITYMGNNPHFNSTNYTRRVYLQQVAEQLMDEIVSRSQNAQIMRHFGPRSGIESMLGKPINPVVVNVPHVSEER
DVTGRIQQKKGKCHLCVKRRATRKECSLCKPVCVEHSSNKVVKNYVSTTNT

>AgaPB3

MADIEWLTPPELSMMSSESQKSAYERKMCDFLRNSEDCEVESIYNDEEDQSI FVLVDNICDSDAEEIQLPEYNASDSNDNDD
FEEAIDPSNSYKARDDTFWHSQPTVPRKILSHNILRSPSSGPTKTKSLSIMNTFKLLITPEICDIIIRETNRKAKQTLE
KLQTENPTAQSRSWNPLTTNEFDAYLGILLEAGVTC SNHVHAADLWKTNSHPLFRASMSLNWFVWINRFIRFDDSRTRTE
RKKEDKATAISGVFGMLLKNLQSCYIAGMNVTVDEQLFPYRGGTGFTQYIPSKPAKYGIKLWWACDAEPSYPINGQIYAG
LSPSGIREKNQGERVVKDLRCRVFRGSGRNIICDNFFTSYNLAISLMEDYKLALLGTVNKRRTFVPSSFSNPKGREVLSTL
FGFSENVAICSYVPKKNWAVVLLSTFHYTEIQGPKNKPRMIADYNRSKGGVDNMDKCLFEYSCKXEDKSV AISIFYNIL
DVAAFAAYKIYKENNPNLYNAINYRRLFLKDLCEQLCTKEIQRRSENTQIMRHFGPRSGVESMLGQSLASTLRQHVDAYS
EEIRDASGRLLKHKGNICYICKRRSTRKSCGKCEKPVCASSHSSNRIYCNQCK

>AgaPB4

MEEIEWLTPPELSNLTEEERTAYTQOKIHEFMIEYGS EDENMISAVVEEDEIPVFDQVIDSDAEVQLPEYNPLETDSDD
DYAESFQLSSATYKTHDGTIWSQPTIPRKILAHNILRSSQSGPTLKTEGLSIIKTFKLLMSDEMIDIIVRDTNRKAQQI
YEREQVTNSGKSASMHTWTKLTSEFEAYLGILLLAGVMRSNYVHSTELWKTSSHPIFRATMSLQRFRSINRFIRFDDRR
TREVRRKMDKSAASDI FAMLNRNLQACYVAGSHVTVDQLYPYRGGTGFTHYIPSKPAKYGIKMWWVCDVAVTSYSIKGQ
IYTRLAPSGQRERHQGERVVKDLCRIFRSGRSVICDIFFTSYNLASSLMPDFKLALLETVNKRRTFVPMPFANPHGREI
QSTLYGFSENISICYFLKKNKSVMLSTMDYDKDVQGPKEKPA MIDYNKFKGGVDNMDKYLSEYSTKRKTNRWPLAFF
FNILDRAAFAAFKIYKENNLQNCQSTDYRRMFLQQLSEQLTMPVIQRRSENVQLMRHFGRSGVESMLGGPLIALSKKNT
TKDVEERDVSGRIKHKGNICYLCKKRSTRKSCSTCKKPICTLH SVIKTSCKPCD

>AgaPB5

MESNDWLSIQQLDELSEERERYNQRLQEMAEESDEEVLLFPSTGEDQNDCLVSGALNDSDAEELQVPEYNHIQXDSG
DEYSEEWLDEYTAEEYKZKNGTVWSSEHPGNTHKILAHNILRZKNTGPXKTKVLSIVHTFKQLVTEEMCDLIFRETNRKA
ILCFQNSNESDRVHSDWKPLTSSEFDAYIGLLLLLAGVXYMPVTELVKTTSSHPMFRASMSIQRFWSISRFIRFDNGQTRQ

QRKTMKAAAI SDVFQMLYANLKS CVYVPGTNVTVDEQLFAFRGGTGFTQYMPSKPAKYAIKVZVWVCTLZKAKYIQAWQYQ
VNRZLYNLSYSLKKLREIZCFLFFFLFKTSGERERNQGERVVKDLCDMFRGSGRNVVCDIFFTTSYNLALSLMLDYKLSIL
GTVNKKRTFVPAFFVKPKGRIPESTLFGFSENVCLCSYVXKKNKCVILMSTSHYDMEITGPKNKPKMIDDYKLNKGGVDN
MDKYLSEYTTKRKTNRWPLAFFYNLLDVAALAAAFVLYKENNPQYNTSPNKRRMFLQQLCEQLAMPEIEIRSTDIQIMRHF
GPRSGIEAMKGGPIKSPDTNETMTPTKRDASGRVKHTGTRFLCVKKRPTRKVCZCKKPVCTQHSKIITKCDHC

>AgaPB6

MNTHTDFTDTHMDLETLDLDTHTDIYSDTDTDTNTVSYDSQDLDEILKELADEEEKEESNIELPSSLETINFTEFLGGQ
KTFQFTGKGGKLTSHYKNITPGESLSLFINDSVLKLIATETNNYAHKKYANGTKNKHARGNYWTPTNEHEVKKIIGILIW
LGFFQFPLEKYWSESPINFNSFLKKLISRQRFQLIMSNFHLSDNERIESPTRLDKISPLVQLLINNYQAVYTPGKDIVID
ESMVPFKGCLIFKQYIPTKAHKYGIKLFKLCNEGYSWMSKVVYAGKNDKEKTKLGVGTNVCFELAEKLMNEGRTLYIDIF
FTSYELALKFLQNKTHVVGTLRFNKKYMPKEVMVSKLKKGEMISKEDPNGIVVLKWRDVRDVRMISTKHAPVLVSTTSAS
KPQRTEKLPVAVIDYDYNQKCGIDKSDQMI SYATHSRRSQKWHKLLALYLLTGTSVVNAHIVYQKANNIKIGIREFREKI
VHEWLCSEYPDIEEENKNNHYLQKRKNSSNKTLRRMVCVNCYIKMLQCSSRDKDVRNAKVHNNVWLQWMAKYTSNVHELFO
RVPLMLFEQLWC

>AgaPB7

MDTNTIEHPALSSNMETDSNTDMDTEVSYNSNELEEILKEIAEEEDMEEEDVELAPSLDAIQWSEFSGRQKSF EFTGKEG
IQIEHSGKITAEESSLFINNDILKLIANETNKYAEAKYTRIEEKHARGNSWTPTNEGEIKKLLGILIWGMGFHQLPMKKC
WSTNEMYNFSFLRNIMCRIRFELLNSNFHLADNSTDSONRLYKIAPLIEMLLQNYQTIYTPGKDIVIDETMVPFKGRLIF
KQYIPSKAHKYGIKLFKLCCTEGYTWSLKVYAGKNNMCKTKMGLGNSISVELANLNMHEGRTLYIDNFFTSYELAIQCLK
KSHVVGTLRYNKKYMPKCVMDKPLKKGEMVSREDPNGIVVLKWKDSRDVRMISTKHVPRMLMPVKSAPKPKSKEKMKPLAV
IDYNLGKCGIDKSDQMVSNATHIRRSRKYHKLAMYLLIGTSVVNAHIYQKINNISITIREFRELVVQEWLCLLENLKPT
PNDIVENFVDNYVVEETFVPAACMEENGSEKCYV

>AgaPB8

MFEANMPKLI EAQSGDEEDIRIPKKNTRNRIVSSDSESDNYDGSDCDCDESSLPDVFREMELEEERNHEGLPQQKSTIQS
TAWSEFTGRQKSF AFVEENQLSLPPLDMTPYNVQFLFVDQEIIEMIVTQTNKYALQKLDNATLSQGARMKWKPTNSAEM
KKFLSLLLWMLGVKVNPNVNYWSKNTLYNFKLPSTVMSRNRFEILLSNLHFTDNTSISPKNRQGKIINLMDKLQEKYQKV
YTPGENIVIDETLIPWRGLIFRQYIPSKAHKYGIKMFKLCSSSEGFTWASKIYSGKSSEGIRETGLAHVICIKLAEKLFK
GRTLYVDNLYTSYELALTCLEDRKTHLVGTLRHNKKSMPRDVLDCKLKKGEMIXVGIIVVLKWKDSRDVRMLSTKHAPYVQ
TTKKCYSNQEPATKLPKPLTVVDYNGKCGIDYSDQMVSYATTMREGVKWYRKLGI ELLLGTSVVNALVVFKTATKRNIGIR
EFREMIASELLQLPVKNTTKXSATRKSCFSSHPSRFQWEKMRRACKRCYNNDRQSMGRSKVRETVKRSFTNCPCPDQPQL
CCECFKIVHQK

>AgaPB9

ZSCALSWKLVTRPASPGKRPSGFVASSDLTIPASYDRFVSDHLFEKIATQTNLHAVAQSRCPNPSP EAWVATDQQEIKR
FFGLTWYDCXPPLRLYWSDDPAYVQTFPKSAMSGERYAHLHLMIVFCNXSSQEQLNRPFLSKIQLPLVDTLQANFKHFVP
TEEEDIAVDESLEIPGXRGRTAFRQKQPQYAAQGGNKVFKLCCGTGYTYALRVVCTKKAQNESTDDVIVSLCEALFNGGH
TLYTDSRYTSLSMATKLLTKRHLVGI FNPGRPGNPPAVVSKQLAAGETFAMEKSKSITVLKWKEKQEEVLLLSTKHSFE
MMKIECRGSSKRKPRIVIDYRRGKAAIDLADRMNAYS LTLCKAMQWYRKLGFDDLLNTALANAYLLYKDATNKQVSI SEF
RKELTVHLTQFYPAETIDPLSMVETMIGFKTQHYFERKPGVTHTVRRYCKQCYAENVARLGRTKSKIIVTKKVATYCRNCE
G

>AgaPB10

MLEEQEDTDFSSFGFVPRRKQRRVLRFFYQLKMKKL VSEKNIQQFKKNGSNRNETMXSFTHFASTFGAKTNI EKVRNCR
TVQDFYSLLVTHZIF EYISEQTNIIYAAQSNNSSNRSKKWPYPTNKDEIKKLFGLPIWMGLVKLPEIRLYWSTKPIYAQSPF
RKIMSRDRFEILLKMLHFSNNELEVKSDRLSKVSYIIKALNQNFQKYDPPETVSIVESLIPFRGRIVFRQYLKKNRHKY
GTKIFKLCFGYGYTYNCSFYAGKIEHEKEKTTPVNVVMKLSEKLLDKGHTIXAQITIGTLYELYEAIEKIRKCLKVGEFIA
KENSNGITVIKWKNRDVLMLSTKHSDKMVI AKIKNRYVLKPKI IYLNSSKKKN

>AgaPBD1

MGDAMHVQWLSEETEEVPENEEDMLYEDVEYIEEYVHFDPGPESNVSGSVAVQNEESTGHVIKIESIDHAFDMLQNSVWS
IKPPERTGTMRKVAHPRPAPVGLAKSAKSPAECLESLFLDADVIAMITEYTNEQIKAEQPNYARERDANPTDEMEIMALL
GVLYIAGTVRDGRENIERLFDTKMGTGLEAVYLTMTSLRYHFLIRSFDDPTAAPDEIEGDKLAPIRPIYERIVSNCQK
YLRPGRFLMLDEQAVQFKGKCEFRQILPSAPGRAGFRFHLLVDCETSYSVNLEICVPENQNPYNLSYAPTDVAMRLTEPV
QGRQKTVILGAGLTSIDLIEKLYASRTMAMGEVPKSYPDLPKALIANKGRPEHSTLAAYHDPATLVSYVTRRKEVMLLMS
SFVDFDSEEQAGEQDEGEQHLKLVLYNRTKTTIRTIQQCAKHNVVRRSTRRPVAVFFNLMLNSAINAWCIYCLNHPEE
AKMSRRDFLVTMALELLRPQARRRLDSKTLPRLLRQIRIGLFLGISREEYETVPVVERQGGESRGRCYLCGRARNKTTRIS
CHSCGKYTCNAHCAQLCRTCYMDDCASEQQE

>AgaPBD2

MADNLNNIPNCFPNNESSSDSDHDAKSDSDMENNIEEVMQASIMEELDEDSQEATGRCVNALEARSSWKPWAGKQKP
FPFFRKKRLRVLDLPAKSTPYEIFSLILDDKLVAHIALAMNLYMEKKNAQKSKASKWLETNPKEVRKFI GLMIWMDLVRVG

RLEDYWSEALYNFAVPRAAMYRERFRALLGAFCFYDDGTSKTDYKEPGKIGAFIDVLQSKFQALLHLGEDVVVREMLAL
GRDRTSFKQYIPASAHHRGRWALFKLCSLEGYTWGLKLCTEQRLIGEALANSVCMELCEPLLNQGRVTYIDNFHASFDL
AQALLANQTHLVGTVRVNGSSMPKDVLLAKLRKGEI IARENDGVMVLLKWKGTCTMGLLSTKHSPALVPMESQVRSNRRW
IRVARIQPEAVIAHIQAKGRPDRSDAIGPHITDLRKGKMKWYKQVGLVLLQLQCVTNAWILHRMVTKKKLLKATFREQLVD
QLVPLPNPTVERGLSGGEKKYTHHLEVRTDGNRGTVRRSCANCYAESRKTMSHYEAGRNNKATTTFCGSCPQPQLCMPC
FNKLNH

>AgaPBD3

MFPLPSNCDPVFTMAALGPYVVI EPLDSEYVVNDTGPAACAEATPNTDGGGEPEQQSDDDDLI CLWEEPQTFGI FDEPVG
TNVPFDGADERTASEYAALVCDDALFDILVKGTNRHRKQWADCMRAGGQSV EYPYRKVTVAEMKRYVGLLLVMGQVRKDCQ
HCYWSTNPLLET PVFANTMSYKRFQOISHYFHGMKQANRTYDAKPVLDHLV PKFQALYAPKQQLIVSELTIPQDVLNGQQ
TEPPNHSEDAQGSTPESAKRLRLLCESDTGYVLNVELANQQLDQVALTDVSI VRPYFGRWHHVYWGNDGITVAAAETLYA
NQLTLAGCGLTRNDPDGTVAPERKSPVLVMDGQGKRILSTIHGAAAMQPTGEGEPQGPACVADLNRHLADLERFEGLLVEE
YLSNASVGVWHIRTVLLLLINVA LLNAYILFSQTD TGSRFTFNVFR LAVAREWVGASEPLEEPTKFLPLIRGRKRKFLPLIP
GRKRKETGLHNRV PKHPARN

>BmoPB1

ADI IAYIVRETNR YGAQLIRSTIPSKPNSRLSRWKDVTSDEIYGFVXVLMQLSLVIDYVEREYWYAVIEELQIGNFKEIMT
YNR FIVIKRCLHFIDNATL PVPPTKLDKI IPIIEHLNKKFKSLYVLEQNI AIDESLLLWKGRLSFAQKIATKRPRVGIKS
YELCESRTGYLWQMEVYTGKGHAVVQDGEPEERGQESDEPESATAQIVLNLTRPLFDKGHTLIMDNFY NAPLLSRI LKV
QHKTDSMGT LRLNREFVPEALKKKTKKNMKEGEVAFSTTKDLSVVVWMDKNIVAMISSFHP I EVGGIEKYGYRYKPVV
LDYNFSGGIDHKDQMLSAYPI ERSRNI I WYKFLRRLNLSMHNALVMFNHNRTHALRHREFRLQLAKQLLQSSRSAAP
SRSLAPAARPEPAACIRDMHLPGKNTKKQRCKLCYSAKVQRSTVWRCTLQCHLCIV

>Pigibaku1

MAKRNSAQRAL ELILE DREVFDD DVEGEDSEEEVSEFEDHISENSESDSDSEEDDEIEHQPVPKQRRATGPGRQQPSPGP
EQASQHGGEIWM SKNSEIEWSSRPRKGP PHKAANVIRMQPGPDMAVTHTRDIKSFELFIPDSIQEI ILDCTNLEGRRVFG
ERWKELDQTLHAYFGVLI LAGVFRSKGESAESLWDAETGREIFRATMSLENFHIISRIIRFDNZDDRPARWQRDKLGI
RTVWDKWRRLPLLYNPGPNVTIDEQLMPFRGRCPFLQYLPSPKPAKNGIKIWAACDATSSYAWN LQVYTGKPDGGAPEKN
PRNESCPRHVSQWQTQHMMRHFFTS HKLQOELLKRKLTIVGTIRKNRSELPPQLLTSKNRPVKSSQFAYTADTSLVSYV
PKKGNVVLMS TLHRDGRMCDQEHKPEIIMDY NATKGGVDNMDKLVTAYSCKRRTLRLWPLVIFFDMLDI SAYNAFVIWM
ALNPEWKRVLQKRRFLLEDLGKALVRPQIERRKHI PRTPASAA MVRRIQKENAGALSTQPTPEQSAEPEVNVZVVNSS
NKKRCCEVCGPKMDRKTQYTCIKCKYICNTHTVKLLWPCV

>Pigibaku2

MSARYNAEEALELIFTHVQQDSSDSEEEVEDLSEEDGEEYNPEHDESSSEEEENPEAERETFLSKNGKITWSSAEYDQH
GRRAEQNVIKMTPGPTRYAVSHARDIVSSFYLFITPAIEKIIEMTNLQGF RKYGDSWKKMDETDLQAYLGLLILAGVYR
SRGKAAASLWDAESGRPIFRATMPLKHFHTYSKLLRFDDRESRPARRVTDKLA AIRDVWDKWEWLPYLYNTMVPFRGNL
FTYFXCLLSKGRCPFRQYMPSPKPAKYGIQSWVACDAKSSYAWKMQVYTGKPTSGCPEKNQGMRVVLDVTEGLRGYNVTC
NFFTSYELRQQLLKRKIMVGTVRKNKPELPPALLASKKRGLLIVSLHAHHHSSFIPKKEKQECSSSEHTAQIRzHzRS
WGQEA I LDYNRNKG VNNLDKVI GTYSYRSMTAHWPLIIFHNIIDVSSYNAFVIWREINPSWMSRKQNKRRVFLEQLGK
ALATPLIERRKHVPRTEASA AVVKAIQSAGAPDQPEVPATTATSPARASKRRCQFCPQKKDKCPHTVCKCKKYICKSC
ALAYCPTCAN

>Pigibaku3

MSGYGP EALKMWD TLCSQPLMELZK KPIMLEVNLTRFSFCVIQRTSYSFFFFMKGDFSSGVMNWRAESGHVGVSLNV
CTEFRYVDLRTVISTLPHQRSNVIKMT PGPKRFASAFQLFIFPIERIIEMTNMEXRPVFQEKGKPVNQTDLHG YIGMM
LLAGGYMSKGEATRLWKEENGRPIFHAKMXETFHMILRVIRFNNHDTRLGDVKKTNYKQRYVZGMZNYLVVQACSPYC
VPQYTPNKPAKYGMKIGAACDAESNYAWNMQVCTGKLPGF TSEKNQGRYVMLEMSSESQGHNITCDNFFTSYHLGDEHQK
RKLTL LGTVSRKKPEL PRESSXILKMQVRPLHSSI FAFTEKATVVSYFPKQNKVXYIEYNPTDVSLSTREDKKPQTTL
PGQLDPQHQPSAIGKVKLRSTSSGHRZKEGKRCQVCP SREDNKTSTSZLNFKNYICRPTVTFCPSCGEQZ

>Pigibaku4

MVVCLYVLALRLTGVQSRVYPASAH CAGIGSSPPATLSGGTSGR KZVRESVEEGTEDRCDWTQYMYFKQFVTD EMLQETA
EQTNLYSVQNECKSVNTTAKEIEQVLGMYMHMGLVQMP CVRAYWEMETKLP AVCDVMSQDQFLKLLTKIHFKNLSVSD
AKKDKLWKL RPWLQKLRDQFLCIRPEECHAVDEIMVPFKGKSHLRVYMPAKPHKWSFKMWGRAGQSGFLYDFDVCQGAQN
PESEKSEVGTGEVVLKMTSTLPAGKNHKVFADNYFTSVPLVQHLKERGIHYIGTIQINRVKDCAMMDEKELKKNRGS
MDFRVNQDNNIIVRWYDNKAVNLISSFVGI EPVGNVWRDRKSKTHIMVPRPAIVETYNKFMGGVLLDMLSALYKFSFRS
RRWYMIWWHTVTVAVINAWK FYRRDQKLEPQMKPMGLRRFQALVGTSLTSAGKTKIKCGRPPSSPEATATPPRKRPS
C SVPLDMRRDGIDHFPTWETRQRCKHCTGNHFSHVYCEKCKVHLCLNKEINCF SAYHKVK

>Pigibaku5

MRWRATLLIPNLAEFENEDETEHDRNGWTP LNYFEQFIDRDLMKT IADCTNAVSLSRSGDLLKTSVDEVYHFFGACILMS
CVPYPKMRMYWSKSLRFTSITDRFTRDRFFKLRQSLKVLIDDDVPEDLRKSDKFWKVRPFLDRILQCCRSQTRPECVSI

EQMMVPFTGACPCRQYLPKMLNPVGIKNFICATTDGIVLDFDLYQGSALREQVEEPEGLSLGSLAMARLCQTLHRGTKV
YCDRLFTSIQGAEZMMKKELMTGTVMKNCSIAEVTYXDKSMQONAGRGTSTEVSTEDGKLCVVKWFDKPKVLMMSAVHGT
QPEDTCQRWDKIQKKYVSRPSIVREYLMKGGVDLIDRMI SYYCMSTRTKKWTMRMLMHFTDLALANSWLLYRKDLTTZDA
PRKSIMQFLEFRVEVARTFLAQQYSQEDDADFPELSEGEDDSTQGKRVPVMAVPHVSVRRRANAHLPemisLknaarcra
AGCTGRTRVRCVTCKVFLCLQTELNcyAAfhtz

>TruPGBD1

MRATSvYATRVrgPrARNVPLDSDDSCLSDSGDSDEEYTPGPGDEPSGSSSDEDADVPPYAPPSAAGARREAATTQRNRQ
KVAWETVKQENSAKEVPVWQDALPDAAEIRLPIQYFRDFFDGELLDKIVEQSNLYCTQQHPNRALNDRPELEQFLGTVV
YMSIFLLPWSRMYWSSTSRVQQAevMSRDRWEEIKHFIHFCDNSAPNDDRLFKIRLVIDSLLPKFQALPQHQMCLCVEK
QMVPFKGRSALRQYSPQKPKYKwGYKLFVLCDDTGLVHSFEIFTGEIGPAPGQPDIGASGNIVLKLQVIPQNVNHLlyFD
HWFSSLDLFFVALANKGIPALGTIQQNLRGCTFSADSEMKNKDRGAFEEQQAVVDDVGIrVVKWFDNRGVI VASTFAGAQ
PVSIIERWERKLKRNVSVECPSSII SLYNKFMGGVDALDALIAYHRIHIRSKKYHRLFFHFVDMaIVNSWLLYRRDCESL
GVPRRKRKDLLAFRASVAQALCMEGKDPMRQKRGRPSLDVDGQFEIKKRRGPAKAI PPQEVRSDAVGHWPVVENGRQRCK
LPNCKGQTVYKCAKCNVHLCLNKVNncfCFEfhk

>TruPGBD2

MQHVKSLIISFIYREDTSYEDSSEEEWNSSATKRGAVGKHRCSDSVSPLSMLSRSPSKRKEERCmCCPGPPKRISNAST
LPKVSSSLQAVGVFSSGEEKQAekELARNEPDADRWHDmDEEDFEPQPRFRPERVPGPQLNRTANYTPLELFQLFFSTTV
IDNLVKHTNANGKKKRQAQKHWHTVTREDMYSFLSLVLYMGMPVKAMTDFWKGSKLYRlPFPSSVMPSNRFLAISRS
HINDPAVETANDLKKGTpgYDKLCRIKPLYEQILAACYTFFHPYQHSVDERMVATKARIGLKRYVRNKPTKWGIKLFVL
ADSSCGYTLNFFVDAGKDPEPTGKGRSYDIVMRI LNVpFLGKGYKLYMDNFYTSPTLFRDLLSRKIWACGLRPNMAGYP
KKKGNDMTDKTPrGTIRWMRQgELLFVKWLDARQVNMCMSTMHKAYSNDTAMRKVKNAKGEWTVKRVPIPGCIKDYNQHM
GVDLSDALI SYYNVLHKTLKWKYKTLFYHFVDIATVNAFILHKEMCKLQDRPELKQKAFREQLILSLAGIGSTPRRSAPQN
HPGLAVAAPAAPSSSQVpDTPPTAPASSHLPAYFVEHMNDVTPRFRATLGRRTCvLCKRKS PVYcSTCKKTLcFTSLRN
CYRDWHRNSICT

>TruPGBD3

MATARKGRELVTILETSADAESSTACDGRESPLNLSADVkwFEIPYRKpDSDEEEEVREEEEDDGGVGGGEGENGFAAA
AAEPADAASFAGGGCNIILVtGSNGITHDEEEYAEDCYSTSTNCSDATSNDSDIDFSDLSEEEERRSFFCFGDDLDDDC
ASPDFWGEpDQVISIIEPFSAVCGPQHSLGDDADTRDYFRILFPDSLFEHMVEQTNKYALYRQRSGKSDPHWHPTDVREM
KAYVGLNILMGINQLPDTGMYWASDIFIGNAGFKKMTARRFEKLTQYLQLCDREFEPGRGERGYDGLFKVRPLLDVVEN
TMWDAYVpNRCLTVDKCSIVTKGRFSPAQYMPAKLRKGLTVWMLCDSRSQYCHRAKIYVGRpVDDEVAASVGYRAVTS
VRGLEQGFHHVFMDSFFTSVPLLRLLRNGIYACGPTQpGRKGYPEVLRPRNIGKLSQGEFYQCQRGNLVATVTRDLKVV
SCLSTNSAPGIVGISPDQREGEAHGDEERDSMESSGASyGHAATFAPAAPVGEHEGRRPLRPAEGVLPGGPGRRARSGGAT
SCGSTSTCASSTPTSSSGRAEGARRPPGFNGKQFTQRHFRVRLAQQLIGDYQGARGMERAARKRHADSPVEYGHRLERMS
ERSRRCRNCTNKGLRHESVFGCKICNVHLCRGGCFSEfhk

>TruPGBD4

CVEPDI PFCDAEVQSADQRDLLTQNSDLPSSTWKSANSWKHPGDANTKDHRIPFVESCGPRHFLPKNSDAIDFFNLLFP
ETLIELISKETNDHAKICQFLWSSFPDWPVTNSEIRGFIGLILMGIKNLPDLSQYWSWTHNDNSYTFYQTMSLIRFRQ
IAANIRMGSVTTAECRGAQSSDALSI FRPMLIELGGAMWSTYQPNCSLAVDRALLPSLEEGRLKEDAKVQPEVWLLCDSK
SGYCHRLSIQVGEKVQGGQCTVVSELVKGLEGKHHHLYLANSLASVPLLQKLLDQGIYASSSFPQFSPILPRELWEEGS
LDKPGDFHQKQFGPLLVTRWRDMKEMGCLSTNAAPGEHDTVWRRSQTkvGELDPVHRPLAFRLLQENMRGVDICKQLLAC
NPLGGIPQDKHWRNLFWFLVNLSIVNAFIMLRESRKDSSPPWVQDGLFTQVIFRKRRLGNQLAKCGQKYLDPGEMARSRTS
IGPTEELVKERHLAKISTFSKRCKNCLKNLRHESVYGCSTCGVNLCkQpSCFWEFHGLPPLHKGCN

>TruPGBD5

MPDTATALDFFQLFVpDNCIQNMVVQTNMYAKKFQERYGSDESwhpVTAeEMKAFLGFVTSTSIHRCESVLSIWSSGFFS
NRSIALKMSQSRFEKILKYFHIVAFRPSQGSNOGLYKIQPFLDSLQQSFSHTFRPSQTQVLHEPLIDEDPVFITCTERE
LRKRKRKfSLWVRQCTSTGFICQISVHLKEGQGSdGLAALKNKPQLHSLVAKQLCQNI SGKNSIIFTGPSMTSLSLFSE
FSEQDIFCCGLLSTRKSDCTGLPQSMVLCGSTPAQRGQSRIMMKGSLSLISWYNKGHFRFLTNSYSPTROGMI IKRKS
GEIPCPLAVEAFAAHLsYICKYDDKYSKYFIFHKPNKTWQqVFWLSISIAINNAYILYKMSDAYAVKRYsRAQFGERLVREL
LELDDCSPTQ

>HsaPGBD5

MPDYRTRALFVQSTLGDsAGPELQLLSIVPGRDLQPSDSFTASSPpPSVWSELEHIRGKSEATELKRPSLPGSIHSL
CGVWCGVGKRTPSSSLVSSLQDLELLGQRQRQLWMESTPRPPYNPFLVpCTPVGKLSAEHGGPTRKMPPSASAVDFFQLFV
PDNVLKNMvvQTNMYAKKFQERFGSDGAWVEVTLTEMKAFLGYMISTSIHCEsvLSIWSSGFFSvNSRSLALVMSQARFEK
ILKYFHVVAFRssQTTGHLYKVQPFLLDLSQNSFDSAFRPSQTQVLHEPLIDEDPVFIATCTERELRKRKRKfSLWVRQ
SSTGFIIQIYVHLKEGGPDGLDALKNKPQLHSMVARSLCRNAAGKNYIIFTGPSITSLTLFEFEKQGIYCCGLLRARK
SDCTGLPLSMLTNPATPPARGQYQIKMKGNSLICWYNKGHFRFLTNAYS PVQqGVI IKRKSGEIPCPLAVEAFAAHLsY
ICRYDDKYSKYFISHKPNKTWQqVFWFAISIAINNAYILYKMSDAYHVKRYsRAQFGERLVRELLGLEDasPTH

>Mmupgbd5

MPPSASAVDFQFLVFPDNLKMMVVQTNMYARKFQERFGSDGAWVEVTLAEMKAFLGYVISTSVSHCESVLSIWSGGFYNS
NRSLALVMSQARFEKILKYFHVVAFRSSQTTHGLYKVPFLDLSQSGFDAAFRPSQTQVLHEPLIDEDPVFIATCTEREL
RKRKRKFLSLWVRQCSSTGFI IQIYVHLKEGGGPDGLDALKNKQQLHSMVARSLCRNAAGKNYIIIFTGPSITSLNLFEEF
EKQGIYCCGLLSSRKS DCTGLPPSMLTNPATPLARGQHQIRTKGNMSLICWYNKGFHFRFLTNAYS PVQKGVIIKRRSGE
PCPLAVEAFAAHSYICRYDDKYSKYFISHKPNKTWQQVFWFAISIAVNNAIILYKMSDAYHVKKYSRAQFGERLVRELL
GLEDSSPAH

>HsaPGBD1

ECAPQIPCSTPIATERTVAHLNLTLDKDRHPGDLWARMHISSELEYAAGDITRKGKRDKARVSELLQGLSFGSDSDVEKDNE
PEIQPAQKLVSCFPEKSWTKRDIKPNFPSWSALDSGLLNLKSEKLNPELVFELFFDDETFNLI VNETNNYASQKNVSL
EVTVQEMRCVFGVLLLSGFMHRPREMYWEVSDTDQNLVRDAIRDRDFELIFSNLHFADNGHLDQKDKFTKLRPLIKQMN
KNFLLYAPLEEYCFDKSMCECFDSDQFLNGKPIRIGYKIWC GTTTQGYLVWFEPYQEESTMKVDEDPDLGLGGLVMNF
ADVLLERGGYPHYLCFDSFFTSVKLLSALKKKGV RATGTIRENRTEKCLMNVHEMCKMKG YDFRIEENNEIILCRWY
GDGII SLCSNAVGI EPVNEVSCC DADNEEIPQISQPSIVKVYDECKEGVAKMDQIISKYRVRIRSKKWYSILVSYMIDVA
MNAWQLHRACNPGASLDPLDFRRFVAHFYLEHNAHLS

>Mmupgbd1p

SPSPTEKAVSTLNTVGSCHPPHDSWAKMHIASLOYITQKGREKAKFRVIELLQGHAFSDESETEEDNEPEVQPERKKIKA
SSIPEKSWTKRDSKPNFPSWSALDSGLLNLKSEKLNPELVFELFFDGETFNLI VNETNNYASQKNVSL ETVQEMRCVFG
VLLCSGFVRHPRMGMYWEISDS DQTLVRNEIRDRDFELIFSC LHFADNKHLDQKDKFSNLRPLIKQMNFLVCPPEEY
CFDKSMCECFDCDQFLNGKPLQIGYKIWC GTTXXQGYLVWFEPYQEDSGVDKELDLGPGGNLIMS FADVLLKEGHHPHYLS
FDSFFT PVKLM SALKKKGVKATGSLCENKTXKCLMNVLMKMMNXGYDFD FIVEEKEEIFLCRWHGDGFI SLCSNAVXIE
PVSKASCVADDKXSFLQVTSIVKLCCECRKGVAKMDQXISKYRVGLRSKRLVWLVSVMVDVAMSNWQLHRI CNPGSP
LDLPGFQKCVACFRLGH DANLSDZ

>HsaPGBD2

MASTRDVIAGRGIH SKVKS AKLLEVLNAMEEEEE SNNNREEIFIAPPD NAAGEFTDEDSGDEDSQRGAHLPGSVLHASVL
CEDSGTGEDNDDLELQPAKKRQKAVVKPQRIWTKRDIRPDFGSWTASDPHIEDLKSQELSPVGLFELFFDEGTINFI VNE
TNR YAWQKNVNL SLTAQELKCVLGILILSGYISYPRRRMFWE TSPDSHHHLVADAI RDRDFELIFSYLHFADNNELDASD
RFAKVRPLI IRMNCNFQKHAPLEEFYSFGESMCEYFGHRGSKQLHRGKPVRLGYKIWC GTTSRGYLVWFEP SQGTLFTKP
DRSLDLGGSMVIKFVDALQERGF LPHYIFFDKVFTSVK LMSILRKKGVKATGTVREYRTERCPLKDPKELKMKRGSFDY
KVDESEEIIVCRWHDSSV VNI CSNAVGI EPVRLTSRHSGAAKTRTQVHQPSLVKLYQEKVGGVGRMDQNI AKYKVKIRGM
KWYSSFIGYVIDAALNNAWQLHRI CCQDAQVDLLAFRRYIACVYLESNADTTSQGRRSRRLETESRFDMIGHWIIHQDKR
TRCALCHSQTNTRCEKCKQGVHAKCFREYHIR

>Mmupgbd2P

AVPARRGAHWTVRSPKLLQVLTAL EEGEFGSNREEISLAPPD NASGDFADEGSGGEDSEQNGAZLPGWVLRALVVLCLGT
QTXEEDPELQPAKKKQQAAGKPQRLWTKRDTHPDFGXWVSDPHIEDLKTKELSLVGLSELFFGDGTTSYIVHETNR
YAXTLNMTQELKCVLGILILSQYISYPRRLVFWETAPDSSHRLVADAI RDRDFELIFSYLCFMGNSGLYDESDRFAKFR
PLIVRMNCHFQKHAPLEXFYSFGESI CEYFEHWGGGWVGGVQASALREASRGYLVWFEP SXKPD RGLDXASMVVRVFDAL
QEHSCLPNHIFFDKVXTSVK LMSILRGKGVKATGTVCEYRIERCPLKDPKELRKRTRYSFH YRVEESQEIIVCHVNI CS
NVVGI EPVRVPSHHPGA AKAQAQVHQPSLVKLYQEKARGVDZMDQNI AKYKVKIXGKKWYLSFTSYVIDAALNNVWQLHR
MCCQDRQGDLLAFRRHVASGASGEQXQTSSQGRRSWRVETESRLDMIGHWIVHQDKRIPCALCHSQTNTRCEKCKQGVHA
KCFQEYHFP

>HsaPGBD3

MPRTL SLHEITD LLETDDSI EASAI VIQPPENATAPVSDEESGDEEGGTINNLPGSLLHTAAYLIQDGS DAESDSDDP
APKDDSPDEVPSTFTVQQPPPSRRRKMTKILCKWKKADLTVQP VAGRV TAPPNDFFTVMRTPT EILELFLDDEVI ELIVK
YSNLYACSKGVHLGLTSSFKCFLGII FL SGYVSVPRRRMFWEQRTDVHNVLVSAAMRRDRFETIFSNLHVADNANLDPV
DKFSKLRPLISKLNERCMKFVPNETYFSFDEFMVVYFGRHGCKQFIRGKPIRFGYKFWCGATCLGYICWFQPYQGNPNT
KHEEYGVGASLVLQFSEALTEAHPGQYHFVFNFFTSIALLDKLSMGGHATGTVRKDHIDRVPLESDVALKKKERGTFD
YRIDGKGNIVCRWHDNSVVTVASSGAGI HPLCLVSRYSQKLKKKI QVQPNMIKVYNQFMGGVDRADENIDKYRASIRGK
KWYSSPLLCFELVLQNAWQLHRTYDEKPVDFLEFRRRV VCHYLETHGHPPEPGQKGRPQKRNI DSR YDGINHVIKQGGK
QTRCAECHKNTTFRCEKCDVALHVKCSVEYHTE

>HsaPGBD3P1

MPQTL SLHEITD LLETDDIIEASARVIQPPENATTPVSD EDESEDEEGVI INNLPGSLLFATAZLIQDGS DAESDSDDP
AHNDDSPGEVPSTSTVQQPPPSRRRKVTKVVFQWQADLTXHPLAGRVTEPPKGF FSKMRTPT ELLFLDEKFFEFIVK
FSNLYAGSKGVHLGLTSSFKCFLGII FL SAYVSAPRRRMFCKQRTDAHNILVSAAMRCDRFETIFSNLDVADNANLDP
DKFSKLRPLISKLNERCMKFVPNETYFSFDESTFPYFGRHRCEQFIRGKPIQFGCKFWCGATCLGCI CWFZPYQGNXNT
KHEEYGVGASFTLQFREALIEAHPGQYHFIFDNFFTSIALLDKVS SMGHQATGTVRNDSTDKAPLEZD IVLKKKERGTFD
YLIDGKGNIA CRWHDNSVVTFASSGAGIDHLC LVSYYSWKQKKKTQVLQPNMKNVYNWFMGGIDRADKNFDKYQAAIHGK

NWYSSXLLFCFKLVLQNAWZLHKTXDEKPVDFLECRWRVVCCHYLQTHGHPPEPGQKGRPSQKHNIDSHYDGINHMIVKQG
KQTRCAECHKNNTTFRCEKCNVALHLKCSVEYHTE

>HsaPGBD3P2

MSQTLNLHEITXLNTDDSI EASTILIQPENATAPVSDSDSGDEEGGTIKNLPGSLLRATANLIKXSDAESNSDDPSYA
LKFDSPEDEPSTSTAQQLPPSRRRKVTKIVCKWKXRDLTAQLVAGRITTEPPNDLFTTEMRTPTIEILELFHDDEVVELIVKY
SNLQARXKGVHLGLTSSEFKYFLGII FLSGYISVPRSRMFWEQXNKPDHNVLVIAAMRRDRFETKFSNLHVADDANLD
PMDKFSKLRLLISKRNERCMKFVVPNETYFVSFNESMVPYSGCHRCKQFIQGKPI MFGCKFCGATCLCHICCFQPYQGKNP
NTKYEEYGVGASLIHKFSEGLXTHPGQYHFVFDNFFTSIALLDKLSMESHQATGTVRKDRINKAPLESVALKKEIIFN
YGIDGKGNVVC

>HsaPGBD3P3

MPZTSLHEITDLELTDNDSIDSSAVVIQOPETAAPVSVSDSGDEEGGI INNLPGSLLHTVAYLIQDGSDAESDSDPSY
APKDDSPDEVPPTSTVQPPPSRRRKVTKIVCKWKXADLTAQLIAARVTEPPNDFFTEMXTPTIEILERFLDDKVVELIVR
YSNLHARSKGVQRGLTSSEFKCFLGII XLNDYISVHRRHTFWEKRTDAHNILVCAAMRCDHFETIFSNLHVADNANLDP
DEFSKLQPLISKRNERCMXDESMVPYFGRHWCFXFTQGKPVLFYKFWCGAICLGYICWFQPYQGKNPNTKHZGYGVVESL
VRQLSEALTEAHPGQYHFVFDNFFTSIVLLDKLSSMGNRATGTVRKDHI EKAPLKL DVALKKEKXGTFHYZIDGKGLVC
RWNDNSVVTVASSGAGIHPCLVHRYSQNNZLKKXTQVQPPNMIKVYNQCIGSIDSADENIDKYRASIHGKEWSSPLL
FCFELVLQNAWQLYKTYDEKPIDFLEFGZCHYLETHGHPPEGRK

>HsaPGBD3P4

MLQTLNLHETIDLLKTDNSSAIVTQSPENATAPVSDSDSGDKEGGTRNNPPGSLLPATAYLIQDGS DAGSDZDDPSYAPK
DDSPDEFSSSTSTAQPPPSKRRKVTKIVCKGIKAGLTVQPIRGRVTESPNDFFTKMRTPIEILELFHDDEVVEFIVKGSN
LCARSKDVHLGLTTSKFKSFLGII FLSGYISVPRRHMFGEQXTDAHNVLAZCTAMRRDCFEXTFNSNLHVADNANLDPMDQ
FSEWZPLASKLNERCMKFAPNETYFVSFDESVPYFGCQCGKZFIWGPPIRFGCKI WCGTTCLGYIXGFQLYQGKNPDTKH
EESGVGASLVLFHGEAII TETHPGQYHFVFDNFFTSIALLDKLSLMGPQATGTVRKYCIDKAPLESAAALKKXDRGKFDYR
IDGKGSTVCRWNDNSVVTIASSGAGIDPLCLVSSYSQKLKKKI QGQPPNMIKXYNQFMGVIHTADENINKYQASICGNKZ
YXSPLLFCFKLVLQNAWQLHKAYDEKPVDFPEFHRRVVCCHYLKTHGHRLKPKRKRPSQKHNTDSYDGINHGIVKQGMQ
WYAECHKNTTFQCEKCDVTLHVKHSVEYHTGQ

>HsaPGBD4

MSNPKRSI PMRDSNTGLEQLLAEDSFDESDFSEIDSDNFSDSALEDKIRPLSHLES DGKSSTSSDSGRSMKWSARAM
IPRQRYDFTGTGRKVDVSDITDPLQYFELFFTEELVSKITRETNAQAALLASKPPGPKGFSRMDKWKD TDNDELKVFFA
VMLLQGI VQKPELEMFWSTRPLLDTPYLRQIMTGERFLLFRCLHFVNSSISAGQSKAQISLQKIKPVDFL VNKFSTV
YTPNRNIAVDES LMLFKGPLAMKQYLPTKRVRFG LKLYVLCEQS QSGYVWVALVHTGPGMNLKDSADGLKSSRI VLT VND
LLGQGYCVFLDNFNI SPMLFRELHQNR TDAVG TARLNRKQI PNDLKKRI AKGTTVARFCGELMALKWCDGKEVTMLSTFH
NDTVIEVNNRNGKKT KRPRVIDY NENMGAVDSADQMLTSYPSERKRHKVWYK KFFHLLHITV LNSYILFKKDNPEHTM
SHINFRLALIERMLEKHHKPGQQLRGRPCSDDV TPLRLSGRHF PKSI PATSGQNPTGRCKI CCSQYDKDGKKIRKETR
YFCAECDVPLCVVPCFEIYHTKKNY

>DpuPokey5

MQKKADAKKVAQHKAANRNWKECKVWGDVGRQSRADDDSPRPQFQERAIQFAPLEEPGPVLSQFNRF SNPLGVFKSMLGG
EDTLYLLREATNDYIAEFWSSRKT PPSRKGKPEGRLIGPRLPAGGFVTDHELVAFFGIQFLIGYHRLPELSMFWEQPP
DAGLGLGIIQQAMTRERFKFISKHIACASPWDDVDPNSDDPDQEPERPDPIRKIRPLVKRLNERYHACRKP PRGQSIDES
MVKFKGRSVLRQTMKNKPIKSGFKIWSRCCHRGYTYKFEIYQGARFGEKQGRSRNNEAVERVVVLDLQPLTDQGFVAFD
RFFTSIALLDKLR ENGVNAVGTILPSRVNQPIMTKNESNLRPDEFAAKFGGEPGT CRKGI FVWRDTKAFRVASNYHGSNL
VKVRRQRDGSFKTKS CPKAIIDYVNNMGVDTANQLRSY YERDRKAKKWWHRLLYS LLETCLVNSWICFN DMVRSQMAE
IKTSNTQ

>CinPBD1

MAVKGVSADETIWSFLEAESEKDKGDAAYACSSDES DILMDEFNATSSKNVDAPNHCCLSSDDETTVHTSSKLQKLLNDR
SKSKRTVQQTHLEELSAEDSMEDWVRIVTDYYPEDHNLRETVMESGMGVTPLDYLAMFLSAEFWDLV TETNRHAAQTL
RKKKLKKGSNLRTWKD TTVAE MKAYFAILL SMGLCNTVDMQDYWSASWITVTSSISKIMSRVRF TLRAMLHFCNDEESS
SKNSQKHNRLFVKRQLIDVLVPKFSALYKPKELAIHEMTVACNYKSEQVRKKPIQWTDK VYALTEARTGYLLEWAIHA
GSSRETEKGASIVRKLCTRYIGKHDIYINTANSY TNRLAKEFVSQTNGSGGIPGELKTINEKNNPVC AKSAVRSSEIKA
KSATQKGNKRSYNDM KKANSKKRYNLSGVIPIFRQLNLF RHKTVKWSLRIFENLAQICV VNSYILYTSKTS DSDKMDL
KKYIEACVSGLLVDYNPHITEKWRPPQPGTVLSRILPPQYVHKI IKIDKKPQCVVCSDSRRKLGRRQTSFMCEKCNVALC
VVPCFHRYHTLKNYRVCHLDM

>CinPB1

MFTVRTFSVEEAAAICCDVDS C DENMSLSESTYDSCESDDFIEPILTASPSTSANIQPVSVDQEV SSTSDVSSACAQP
VHPKRAKMTKVKTNRKRPKV TNTSNIPHDLQDFNWE PVNNSFETSFI PQSSSFSETSGYGGDLVLADSTPLDLLGLFLT
EFWQLLVDIFKSKLTSYLQKQTDLPKFSKFRKWSPVTHADIKAYFAMNLLMGLCSKHSIKDYWSMYSY TTAGISSLMP
RDRFQSIRAF LHFNNENYIPRGQPGHDRIFKIRNIVELVTKNFSKHYPHKELSLDEMTIAYKERSSIKQYNPIKPKVF

VLSEARTGYALQWDLTYGKSEVDVSSVSKTHAIVRKLSEYELHKGHDIYMNSYYTNPYLANELSKLKTGVCGTISATRKG
MPESLKKKLNKTKKGGDDPIFLRSGDLLACAWHDVRRRLTMLSTIHNASSTETTIRSKKVDGTGTRTILKPICVAEYNRHMGG
VDRMDQRMKTYIFPHRSKWMYRIYDGIISIAMVNAHIIISFSCPSSSNKKPKSLKQFIEEIIASELLNGYTSARKRAGKQQ
SPLHFKRLIPFQHQLGFLGKTRKSCQCCNKQTMTLCKKCNVSLCALDCFERYHSLQEYRMK

>CinPB2

MMQLQLILSGDVSDVEDIGSSSEDETNTVQESFQDTVMNISVPDKVESEHKKKHVYRWRKRNI PVTDSNFQLQKDNIDS
IHSPITYFMQFFPESLIRTIIVEQTNLYSTQKIGVSINTNYSEICMFI AIQIKMSILHLPSYLMYWSKEMRFPPIADSI SL
KRYQKLRRFLHFVDNSTFNSDNPNKLFKIQPVLDAVRNECIKIQPEQSHSVDEQIIPAKTKYSKFRQYNPKKPVKMGFKN
MVRADSSGFMYDFYIYGGKDSKQLALSDDATHLQKSAQTVVVKLCQHLPVKQNHQLFFDNWFTTLDLLIYLKEIGINACGT
IRGNEDLKKNGRGAVDFRSDFNSGILVTKWYDNNNAVHIGSNFVGI EPMSIDRWSSSEIKEKVP IQCPQIITMYNKGMMGV
DLADMLISLYRTEVKTRRWYIKI FWHCIDI AKVNAWLLYRRHCNEMSI SKKSQRTLLNFVVDISDNLLYRNSCSTPTRGR
PSNRKRLENDTLP GKPFPTPTPNEILRFDQISHWPEPRSQRGRCLCKSGYSQIYCSKCHVCLCLKSSNNCFKEFHCKN

>CinPB3

MFSATAAAEILMDAGSDLSDESDEHDEDDVGSFIVPNVADISDSSESSDDSLPPPPPPANVWKSSITQQSLNSFLGQH
GPSSHACVSNDDSPLEYFRLIFTDELTLVVEETNRYAAQYLQKTSLSKSKRAHKWKPVDAAEELSFLGLTLLTGVVHKR
GKLESYWIKNSMIETPYFGKCMSRNYQAITGFLHFNDNEKLAENIDNDKLYKVRPVYDLIVARWKALYNLGEHISIDEG
MMKWRGRLGFRVYNKDKPIKYGIKSYILADSHSHYCWNLDMYHRVQKTLKETVSQLTSKCHFLWHSYMDNFYNSVMS
QMLLAFQIHSVGTLSNRGEPREIRTPPNQMKKGDIIARQNQSVTVLAWKDKRVVKAISTKHDA SVTTITRRQRRGGEXE
SVEKPVC IADYNLHMSGVDQVDQMI SYPCHRKSLKWTKKVFFYFMTISVHNAYILYKSKSSAKSCKTLYSFI LTLVSQL
CQQDRLQPQIDDENLAGPPPKSPRIDSTKRLKGGFKKHVIALYPTKKKAAAQRPCRAMKNGCRKDTILL

>CinPB4

LLFATAATEILLDAGSDLRDZESDHDEDDVASFIALNVAYSSNSDDSDNSLPPQANVWKSTITQQSLNSFLGQQGP
SSHACVSNKDSSEYECFRLIFTDELTLVVEVIIRYASQFIZKTSLTPKFRANKWKPVDAGMCLFLRLTLVTSIKRRNLG
SKWSKDSMIEXYFGKSI SXIZYQVITGFLHFNDNKKLPENIDNDKLYKILSVYYLIVARWKS LYNFGDHI SIDEGMIKZR
GKLGFRVYNKNKPIKYRIKSYFLADSHYCWNLGMYHRVQNXLKETVSQLLTZLYMDNFYNSVMSQIXLAI ZIHSVVTLR
SNREEPCEFZTPPIQMKKGDIIARQNKSITVLAWKNIRVVKAISTKPDASLTTITRZQRRGXEKESIKKPVCI TNYNLHM
SGVDQVDQMKIVYYLCHHKS LKWTKKVFFYFIKISLYNAYILYKSKSMALYKILYSFILKLVSQLCQQDRLQAEVDDD
TVAGPPPKSPRINSSNRLKGGFKKHVIVLYLPTKKKTAQRRCRVCMKNSCRKDARYYCAYY

>CinPB5

ELLELETNRYAAHTLDNKTPTSSRLQRWKDTNIPEMKAYFVLLLLTMGLCHKPDINDYWSAFSVTLTSGYGKIMSRNRLF
LIRSMHLFCNNEDFI PRHEENYDRLFKIRRLVDIIVPKFDQVYKPKQQLSLDEMTIAFKGRSTIKQYNPHKPSKWGYKVF
ALTEATTGYLLQWEMYAGSSMETDEDVSKTHSIVRKLCSGYMGKQHEVYMNSYSSNPYLAKEFKEKKTGICGTINCNRKG
MPDELKKKLNKTKKGGDDPVYMLSGDILCCAWHDTKRLTMLSTIHDAGVSEKSI RSKTSETGTRMVMKPNVTEYNKYMGG
VDRIDQIRITYLFPHRSRKYMRIFDNLIQICLVNSHVIYNTLPSGSNEKKLTLKFYIQECITGLLQEYTPGVLSPPRKS
KDTISRIVPDQYYHKLIIKEESSKPNCAVFFLSVZANTRDYPNDLKCKQAIRGKSREKDFWYICLEITIZ

>DmeCG9839

MSSSGRKRKQQLKPRQDDHRSVPKRRSVDIKSEPLDGYPALADYDLSTADIKPDLTELQQLVAEQQAASNTIRLELEQQ
ESDSDEDGYSELDYQAEDVFCQDDMDYDPDWSSQQTGSRLLFKFP IQQSGLKFGQRFQGPQHYFNQVLGNRSKFFSSLA
QSCNLKGGELKSNPTTAAEMEIFMALSLLMCDLKLEHLSDYWSTNMFYGLVGFSGKIP LERYQQLLHCLNFDAPQLQAGR
AKVKNLLLLDFINERMEEIYICGQQLVLNEPITLWKGALRYQDELPNKFRTNALLLHMLTEQSGLVVKILPEIVRKEDAP
AWVRNSRQLVEHRNKIVLKLMEGYHGGRTVYTSKFYGSYGLAQELAKKSTYCTGLLDRNRYGNSKALVHQRLDSNSIST
YATSLMMAKWRRRAKSLYCFSSDCLAIYSKEMAMQKTNAKPKLIQEFELQRLPNDGRHHLIHYQAACKELKANIKLTI
LLNILVYNAYLLYFANGQARVGHLSYSEFRV I IKSLLREEVTNEPVTSIQKPETYERSKNKPVPEPRLKTI LHEPML
IQQNGKPAKKNCRYCHKGGMLQFSRYMCNTCPDKPGLCQEPFLLWHEQLKKVIRQTI GRSE

>DmeCG13151

MECVLDEELLANIKCSDQEEDEDEGEKMEVEERLPVVDSTVQSASFNGDDSDPLQEAVCNFPWIFEDSDMLMNEQDLADV
VLKKEDSARPAAPKRGRGRPPNNNGNYTSPCGQLWSVTRSPDISAEDLPLLGQACGKGPARTVSNAVEAWMLLFDDEML
RSLLRHINEQMRKRRTATS VQRPLDVVELRAFLGLSYL CGVFRNARHNGPLDELWTLELGNAI FRASMSLARFESI SECL
AGNCGWSEGQKLWQRLI INCRSYGCSWLTVDETFCAVAKSRMTLCCDARTLYMANAVVSRNQRC PDKDVEQLICDFKT
TGRNVTLGSRYLNL TQCEQLAQRQISSLGKLEANS PHWPRQWPTE SPLFGGSSKLI PLDGDVAVFCGLSSQVDAVQAYEQ
TSEACQQFYEHSQRFSTAHATPAPLKKQINPFLQLLHFVNLAAVNAWILLRLSPKGDAAMDQRDFQRQLGLFLTQQRLQ
RRLQRRSTSTSLVMRLQICEILGQSSQRLSEATGEAKLTHSVGVLT PDKMSLPLGINLASRYGKHKRCKPCARNKRG
KSRTRCQQLQHRCGNHLISRCYECVGI L PGQLPEGNMVDEGAT

>DmLOOPER1m

MEDI STVLEKNLEGILERGESIEIDLLENTVIEGCEPDCVVVDSCLEKIDPKTLKWRTRPFVAPESI WEDDKTFDVGDI
KTTVEFFYTLFDTQLIHLMARQTDIYSLQEHGIELKCTDEEIKRYIGILLYFGVLKLPQFRMAWSKDLKITAITDSMPRG
RFKKIKQCLHFNDNAKQLKKGDCNYDKLYKIRPLLRILKXILEKLTQEEHQSVDEQIIAFKGTFLIFFXSKPHKWGLKMF

TRAGISGLVYDFTLYVGEGETSPSYGLGISSYVVLVLAESLPKDKNFKLYFDNWFTSVILLISLKEIGIFATGTVRMIKXQ
PVVICRWSPKAKAYIDISGPAIVALYNKGMCGVDLADMMELYKINNRSTFFIVAWEYSLQKLRIRIGNNSZZPQNK
IFSLSNFNRKLP MNFYIPLALLHLKKETSKNKZRTRKLSIIIGIPKQCLFASIKEVQIFDKSYXEHVVFGERGRCLCK
TATPMTKCLTCKVHLCCNNNKNCFFVI PHLNCHYKEKYFIFCDL

>NhaPB

MRGTKSLIPEGIPANSPPKHHQFILIPSM TSPPILEEQVINPYDDNSFIKEESHCLWQDDPTQAVNLPAENDRGTFNK
PFHVEIRKFRISPLPPTPLQLFLPLISLVEKWVSYTNSWITCLKENGVDVSWNNPMGKTSYLHKWEGTTVSEVLTMIG
VLIYMDVHKEKTIRSYWNPPKPGVQRP AHSFIKFI SYNKFLIHRRLRPF DHTKYDETAIPKVFQCV EEWSDHIQAVSM
QIFLPGSHLAVDECMIRYTD RSDDITVIKSKPDPVGFKIWVIAQYGF FIRWIWHVKEKPHGAVGVEFQLRSHHHKVGQAS
EEKSQSKPLI

>OsaPB

MQEPPDLFVHSDGSTETKLIKEKRKHFD SASSFFAYLPLSFWKAVLGETNKYAAASPAKGKTVTLEELMRFFGIMFYMT
IVDKGEYSNYWGEQVEDEIFGVTSTLGLEKLMTLKRFYIRKNLCFRYDISKADLKKDPAARIRPLINMIKHTSLKYVVLG
RNVAVDESSIACRSKFGRHMIVYNAKKPTGKFHFKIYACCCATTWLMVGFRLHCDSDMEDRLRDVIPA VDAQNLNRLQF
SSSVRQIVLEVTRPIHNTQRVVNTDNWYTSVTLMLSLRDVGLYGRGTIRENSAHFPKAHMF AKKANEPGSSSLQGVSNTG
QMIAASWMDGS AVNILSNADSSGMGEVTRMIGKERVVFPAPKCVAEY NKYMQGVDRDLQ LRAKYSLADGHSMQKWHKLA
LAFIDIARVNAYVTKLRDDKPLRNQHRQFMI ELASELITGKWN DTVENEGMVFADDQLSTTSRSTTGYPKAPSTVASPT
PPCDVVL SLTRFPEATRGKRGCKVCMFEGRTWTMKTLYCIRHNVCLCTKSYSLNQSLADVVC PHTDWT SWQKYNDYYLPN
GIFDEHGR

Supplementary Data File 2. CLUSTAL alignment file of amino acid sequences of 50 *piggyBac* –like sequences.

CLUSTAL X (1.81) multiple sequence alignment

```

TniPB      -----MGSSLDDEHILSALLQSDDELVGEDSDSEIS
BdoPB      -----
AgaPB1     -----MFISDKESTCQGPRKHTYVADIGTGP
AgaPB2     -----MTDIEWLELSPALESLSADKLNRYQKILD
AgaPB3     -----MADIEW--LTPEELSMMSESQKSAY-ERKMC
AgaPB4     -----MEEIEW--LTPEELSNLTEEERTAYTQQKIH
AgaPB5     -----MESNDW--LSIQQLDELBLEERERYNQRLQ
AgaPB6     -----MNTHTDFDTHMDLETLTDLDTHT
AgaPB7     -----MDTNTEIHPALS-----S
AgaPB8     -----MFEANMPKLI EAQSGDEEDIRIPKKNTRNRIV
AgaPB9     -----
AgaPB10    -----MLEEQEDTDFSSF
AgaPBD1    -----MGDAMHVQWLSEETEEVPENEEDMLYEDV
AgaPBD2    -----MADNLNNIPNCFPNNESSS
AgaPBD3    -----MFPLPSNCDPVFTMAALGPVYVIE
BmoPB1     -----
Pigibaku1  -----MAKRNSAQRAL ELILEDREVFDD DVEGE
Pigibaku2  -----MSARYNAEEALELIFT--HVQDSSDSE
Pigibaku3  -----MNVCLYVLALRLT--GVQSRVYPA
Pigibaku6  -----MSG--YGPEALKMWDT-LCISQPLMELZ
Pigibaku7  -----
TruPGBD1   -----MRATSVYATRVR--GPRARNVPL
TruPGBD2   -----MQHVKSLIISFIYREDTSYEDSSEEEWNSSATKR
TruPGBD3   MATARKGRELVTILETSADAESSTACDGRSPLNLSADV KWF EIPYRKPDSDEEEEVREE
TruPGBD4   -----CVEPDI PFCD AEVQSA
TruPGBD5   -----
HsaPGBD5   -----MPDYRTRALFVQSTLGD SAGPELQLLSIVPGRDLQPSD
Mmupgbd5   -----
HsaPGBD1   -----ECAPQIPCSTPIATERTVAHLN TLKDRHP-GDLWARMHISS
Mmupgbd1p  -----SPSPTEKAVSTLNTVGSCHPPHDSWAKMHIAS
HsaPGBD2   -----MASTRDVIAGRGIH SKVKS AKLLEVLNAMEEEEEES-NNNREEIFIAP
Mmupgbd2P  -----AVPARRGAHWTVRSPKLLQVLTAL EEGEF-GSNREEISLAP
HsaPGBD3   -----MPRTL SLHEITD LLETDD S--IEASAVIQP
HsaPGBD3P1 -----MPQTL SLHEITD LLETDD I--IEASARVIQP
HsaPGBD3P2 -----MSQTL SLHEITX-LNTDD S--IEASTILIQP
HsaPGBD3P3 -----MPZTL SLHEITD LLETND S--IDSSAVVIQQ
HsaPGBD3P4 -----MLQTLNLHETIDLLKTDN-----SSAIVTQS
HsaPGBD4   -----MSNPRKRSIPMRDSNTGLEQLLAED
DpuPokey5  -----MQKKADAKKVAQHKAANRNWKECKVWG
CinPBD1    -----MAVKGVSADETIWSFLEAES-EKDKGDAAYACSSD
CinPB1     -----MFTVRTFSVEEAAAICCDVDSCDENM SLSESTYDSC
CinPB2     -----MMQLQLILSGDVS--DVEDIGSSS
CinPB3     -----MFSATAAAEILMDAG
CinPB4     -----LFFATAATEILLDAG
CinPB5     -----
DmeCG9839  -----MSSSGRKRKQQLKPRQDDHRS PVKRR
DmeCG13151 -----MECVLDEELLANIKCSDQEEDEDEGEKMEV
DmLOOPER1m -----MEDISTVLEKNLEGILERGESI
NhaPB      -----MRGTKSLIPEGIPANSPPKHHQFILIP
OsaPB      -----

TniPB      DHVSEDDVQSDTEEFIDEVHEVQPTSSGSEILDEQNVIEQPGSSLASNR-----I
BdoPB      -----

```

AgaPB1	SKETCRASSTRQATDSNAGRTPRVVPKSKKDQVDIQSKEAAKTNRRTLEGLG-----
AgaPB2	ELTEQ-----VVGYLEEDD--IASIAN-FDDSDVEDIEIPQYDYDETD-DEDFDEEYE
AgaPB3	DFLRN-SEDCEVESIYNDEEDQSIFVLN-ICSDAEEIQLPEYNASDSDNDDDFEEAID
AgaPB4	EFMEYGSSEDENMISAVVEEDE--IPVFDQVIIDSDAEEVQLPEYNPLETSDDDDYAESFQ
AgaPB5	EMAEEGSDEEVLLFPSTGEDQNDCLVSGA-LNDSDAEELQVPEYNHIQXDSGDEYSEEWL
AgaPB6	DIYSDDTDTDTNVSYSQDLDEILKEL-----
AgaPB7	NMETDSNTDMDEVSYSNELEELKEI-----
AgaPB8	SSDSESDNYDGSDCDCDESSLPDVFREM-----
AgaPB9	-----
AgaPB10	GFVVPRRKQRRVLRFFYQLKMKKLVSEK-----
AgaPBD1	EYIEEYVHFDPGPESNVSGSVAVQNEESTG-----
AgaPBD2	DSDHDAKSDSDMENNIEEVMQASIMEE-----
AgaPBD3	PLDSEYVVNDTGPAACAEATPNTDGGGEP-----
BmoPB1	-----
Pigibaku1	DSEEEVSEFEDHISENSESDS----DSEEDDEIEHQVPVKQRRATGPRQPPSPGPEQAS
Pigibaku2	EEVEDLSEEEEDGEYENPEHDE----SSSEE---EENPEAER-----
Pigibaku3	SAHCAGIGSS-----PPATLSGG-----TSG-----
Pigibaku6	KKPIMLEVNLRFRSFCVIQRT---SYFMMKFGDFFSSG-----
Pigibaku7	-----
TruPGBD1	DSDDSCLSDSGSDSEEYTPGPGDEPSGS-----SSDEDADVPPYAPPSAAGARREAA
TruPGBD2	GAVGKHRCSDSVSPLSMSLRSPSKRKEERCMPGPPRKRISNASTLPKVSSSLQAVGVF
TruPGBD3	EEEDDGGVGGGEGENGFAAAAAEPADAASFIAGGCNIILVTGSNGITHDEEEYAEDCY
TruPGBD4	DQRDLLTQNSDLPSSTWKSAN-----
TruPGBD5	-----
HsaPGBD5	SFTASSPPPSVWSELEHIRGKSEATELKRPSLPGSIHSCLCGVWCGVGKRTPSSLVSS
Mmupgbd5	-----
HsaPGBD1	LEYAAGDITRKGK-KKDKARVSELLQG-----LSFSGSDSVEKDNEPEIQ----PA
Mmupgbd1p	LQY----ITQKGR-EKAKFRVIELLQG-----HAFSDESETEEDNEPEVQ----PE
HsaPGBD2	PDNAAGEFTDEDSGDEDS-QRGAHLPGSVLHAS-VLCEDSGT-GEDNDDLELQ----PA
Mmupgbd2P	PDNASGDFADESGGEDSEQNGAZLPGWVLRALVVLCLGTQTXEEEEEDPELQ----PA
HsaPGBD3	PENATAPVSDEESGDEEGGTINN-LPGSLLHTAAYLIQDGSDAESDSDPSYAPKDDSPD
HsaPGBD3P1	PENATTPVSDSEDEEGVIINN-LPGSLLFATAZLIQDGSDAESDSDPSYAHNDDSPG
HsaPGBD3P2	PENATAPVSDSEDSGDEEGGTIKN-LPGSLLRATANLIKXSDAESNSDDPSYALKFDS
HsaPGBD3P3	PETAAAPVSVEDSGDEEGGIINN-LPGSLLHTVAYLIQDGSDAESDSDPSYAPKDDSPD
HsaPGBD3P4	PENATAPVSDSEDSGDEEGGTRNN-PPGSLLPATAYLIQDGSAGSDZDDPSYAPKDDSPD
HsaPGBD4	SFDESDFSEIDSDNFSDSALEADKIRP-----
DpuPokey5	DVGRQSRADDDSPRPQFQERAIQFAPLE-----
CinPBD1	ESDILMDEFNATS-----SKNVDAPNHCCLSDDDETTVHTSSKLQKLLNDRS
CinPB1	ESDDFIEPILTASPSTSANIQPVSVDQEVSSDSDVSSACAQPVHPKRAKMTKVKTNRK
CinPB2	EDETNTVQESFQDTVMNISVPDKVESE-----HKKKHVYR-----
CinPB3	SDLSDLESDHEDDDVGSFIVPNVADIS-----
CinPB4	SDLRDZESDHEDDDVASFIALNVAYSS-----
CinPB5	-----
DmeCG9839	SVDIKSEPLDGYPALADYDLSTADIKPDLTELQLQLVAEQQAASNTIRLELEQQESDSDE
DmeCG13151	EERLPPVDSTVQSASFNGDDSDPLQEAFCNFPWIFEDSDMLMNEQLADVVLKKEDESAR
DmLOOPER1m	EIDLLENTVIEGCEPDSCVVVDS-----
NhaPB	SMTSPPILEEQVINPYDDNSFIKEEHS-----
OsaPB	-----
TniPB	LTLPQRTIRGKNKH-----CWSTSKSTRRSRVSALNIVRSQRGPT
BdoPB	-----STRRSRVSALNIVRSQRGPT
AgaPB1	KLAVGSVVEAPDGT-----QWKVVEVNNANGGIVAEVNVIRDVPG
AgaPB2	LENAPESYTARDGT-----IWTQ-PPPLRKILMHNVIKDNLASH
AgaPB3	--PSNS-YKARDDT-----FWHSQ-PTVPRKILSHNILRS--PSS
AgaPB4	--LSSATYKTHDGT-----IWSSQ-PTIPRKILAHNILRS--SQS
AgaPB5	DEYTAEEYKZKNGT-----VWSSEHPGNTHKILAHNILRZ--KNT

AgaPB6 ---ADEEEKEESNI-----ELP-SSLETINFTEFLGGQKTFQFTG
 AgaPB7 ---AEEEDMEEEDV-----ELA-PSLDAIQWSEFSGRQKSFEFTG
 AgaPB8 ---ELEEEERNHEGL-----PQQKSTIQSTAWSEFTGRQKSF AFVE
 AgaPB9 ----ZSCALSWKLV-----TRPASPGKRPSGFVASSSDLTIP---
 AgaPB10 ----NIQQFKKNGS-----NRNETMXSFTHFASTFGAKTNI EKVR
 AgaPBD1 --HVIKIESIDHAF-----DMLQNSVWSIKPPERTGTMGRKVAHP
 AgaPBD2 ---LDEDSQE QATG-----RCVNALEARSSWKPWAGKQKPF PFFR
 AgaPBD3 -----EQQSDDDDLICLWEEPQTFGIFDEPV
 BmoPB1 -----
 Pigibaku1 QHGGEIWM SKNSEI-----EWSSRPRKGP PHKAAN-VIRMQPGPD
 Pigibaku2 ----ETFLSKNGKI-----TWSSAEYDQHGRRAEQNVIKMTPGPT
 Pigibaku3 ----RKZVRESV-----EEG-----TEDRCDW---
 Pigibaku6 ---VMNWRAESGHV-----GVSLNVCTEFRYVDLRTVISTLPHQS
 Pigibaku7 -----MRW-----RATLLIPNLAEFENEDETEHDRNG--
 TruPGBD1 TTQRNRQKVAWETV-----KQENSAKEVPVWQDALPDAEAIR---
 TruPGBD2 SSGEKQAEKELARN-----EPDADRWHDMDEEDFEPQPRFRPER
 TruPGBD3 STSTNCSDATSNDSIDIFSDLEEEERRSFFCFGDDLDDDCASPDFWGE PDQVISIEP FSA
 TruPGBD4 ----SWKH PGDAN-----TKDHRIIPFVESCGRHFLPKNS---
 TruPGBD5 -----
 HsaPGBD5 LQDLELLGQRQRQL-----WMESTPRPPYNPFLVPCTPVGKLSAE
 Mmupgbd5 -----
 HsaPGBD1 QKKLKVSCFPEKSW-----TKRDIKPNFPSWSALDSGLLNLK---
 Mmupgbd1p RKKIKASSIPEKSW-----TKRDSKPNFPSWSALDSGLLNLK---
 HsaPGBD2 KKRQKAVVKPQRIW-----TKRDIRPDFGSWTASDPHIEDLK---
 Mmupgbd2P KKKQQAAGKPQRLW-----TKRDTHPDFGXWEVSDPHIEDLK---
 HsaPGBD3 EVPSTFTVQQPPPS-----RRRKMTKILCKWKKADLTVQPVAGR V
 HsaPGBD3P1 EVPSTSTVQQPPPS-----RRRKVTKVVFkWQADLTXHPLAGR V
 HsaPGBD3P2 EDPSTSTAQQLPSS-----RRRKVTKIVCKWKXRDLTAQLVAGRI
 HsaPGBD3P3 EVPPTSTVQQPPPS-----RRRKVTKIVCKWKXADLTAQLIAGRI
 HsaPGBD3P4 EFSSTSTAQQPPPS-----RRRKVTKIVCKGKIKAGLTVQPIGRV
 HsaPGBD4 ---LSHLESDGKSS-----TSSDSGRSMKWSARAMIPRQRYDFTG
 DpuPokey5 ---EPGPVLSQFN-----RFSNPLGVFKSMLGGEDTLYLLR---
 CinPBD1 KSKRTVQQTHLEEL-----SAEDSMEDWVRIVTDYYPEDHNLRET
 CinPB1 RPKVTNTSNIP HDL-----QDFNWEPVNNSFETSFIPOSSSFSET
 CinPB2 ----WRKRNI PVT-----DSN-----FQLQKDNIDSIH---
 CinPB3 ---DSDSESSDDSL-----PPPPPPANVWKSSITQQLNSFLGQH
 CinPB4 ---NSDDSSD NSL-----PPQ--PANVWKSTITQQLNSFLGQQ
 CinPB5 -----
 DmeCG9839 DGYSEL DYQAEDVFC-----QDDMDDYDPDWSSQQTGSRLLFKFP I
 DmeCG13151 AAPKRGRGRPPNNG-----NYTSPCGQLWSVTRSPDISAEDLPLL GQ
 DmLOOPER1m ----CLEKIDPKTL-----KWRTRPFVAPESI WEDDKTFDVG---
 NhaPB --HCLWQDDPTQAVN-----LPAENDRGTNFKPFHVEIRKFRISP
 OsaPB -----MQEPP-----DLFVHSDGSTETKLIKEKRKHFD---

TniPB RMCRNIDYD-----LLCFKLF FTD--EIISEIVKWTNAEISLKRRESMTG-----AT
 BdoPB RMCRNIDYD-----LLCFKLF FTD--EIISEIVKWTNAEISLKRRESMTG-----AT
 AgaPB1 PSAYAKRYVVAGAVSSSWRLIIDN--GILNQIRKCTEIEARRVLQT-----K
 AgaPB2 LKNKSDKDK---SAVDIFKLF FST--PICEIVIRETNRKADQFCANYNASHP---DSNIQ
 AgaPB3 GPTKKT KSL---SIMNTFKLLITP--EICDIIIRETNRKAKQTLEKLQ TENP--TAQSRS
 AgaPB4 GPTLKTEGL---SIIKTFKLLMSD--EMIDIIVRDTNRKAQQIYEREQVTNSGKSASMHT
 AgaPB5 GPX-KTKVL---SIVHTFKQLVTE--EMCDLIFRETNRKAILCFQNSNESDR---VH SKD
 AgaPB6 KGGLKTSHYKNITPGESLSLFINN--SVLKL IATETN NYAHKKYANGTKN---KHARGNY
 AgaPB7 KEGIQIEHSGKITAEESLSLFINN--DILKLIANETNKYAEAKYTR--IIE---KHARGNS
 AgaPB8 ENQLSLPP-LDMTPYNVFQLFVDQ--EIIEMIVTQTNKYALQKLDNATLS---QGARMSK
 AgaPB9 -----ASYDRFVSD--HLFEKIATQTNLHAVAQSRCP-----NPSPEA
 AgaPB10 N-----CRTVQDFYSLLVTH--ZIFEYISEQTNIYAAQSNSS-----NRSKK

AgaPBD1 RPAPVGLAKSAKSPAECLESLFLDA--DVIAMITEYTNQIKAEQPN-----YARERD
 AgaPBD2 KKRLRVDLPAKSTPYEIFSLILDD--KLVAHIALAMNLYMEKKNAQ-----KSKASK
 AgaPBD3 GTNVPFDGADERTASEYAALVCCD--ALFDILVKGTNRHRKQWADCMRAG----GQSVEP
 BmoPB1 -----A--DIIAYIVRETNRGAQLIRSTIPSK--PNSRLSR
 Pigibaku1 -MAVTHTR----DIKS-FELFIPD--SIQEIIILDCTNLEGRRVFGE-----R
 Pigibaku2 RYAVSHAR----DIVSSFYLFITP--AIEKIILEMTNLQGFRKYGD-----S
 Pigibaku3 -----TQYMYFKQFVTD--EMLQETAEQTNLYSVQ-----N-ECK
 Pigibaku6 RSNVIKMTPGPKRFASAFQLFIFP--IERIILEMTNMEXRPVFQE-----K
 Pigibaku7 -----WTPLNYFEQFIDR--DLMKTIADCTNAVSLS-----RSGD
 TruPGBD1 -----LPIQYFRDFFDG--ELLDKIVEQSNLYCTQ-----QHPNR
 TruPGBD2 VPGPQLNRTANYTPLELFLFFST--TVIDNLVKHTNANGKKKRQ-----AQQKH
 TruPGBD3 VCGPQHSLGDDADTRDYFRILFPD--SLFEHMVEQTNKYALYRQRS-----GKSDPH
 TruPGBD4 -----DAIDFFNLLFPE--TLIELISKETNDHAKICQFLWS-----SFPD
 TruPGBD5 -----MPDTATALDFFQLFVPD--NCIQNMVVQTNMYAKKFQER-----YGSDES
 HsaPGBD5 HGGPTRKMPPSASAVDFFQLFVPD--NVLKNMVVQTNMYAKKFQER-----FGSDGA
 Mmupgbd5 -----MPPSASAVDFFQLFVPD--NVLKNMVVQTNMYARKFQER-----FGSDGA
 HsaPGBD1 -----SEKLNPELVFELFFDD--ETFNLIVNETNNYASQ-----K--NV
 Mmupgbd1p -----SEKLNPELVFELFFDG--ETFNLIVNETNNYASQ-----K--NV
 HsaPGBD2 -----SQELSPVGLFELFFDE--GTINFIVNETNRYAWQ-----K--NV
 Mmupgbd2P -----TKELSLVGLSELFFGD--GTTSYIVHETNRYAX-----
 HsaPGBD3 TAPPNDFFTMRTPTIEILELFLDD--EVIELIVKYSNLYACS-----K--GV
 HsaPGBD3P1 TEPPKGFFSKMRTPTELELFLDE--KFFEFIVKFSNLYAGS-----K--GV
 HsaPGBD3P2 TEPPNDLFTEMRTPTIEILEFHDD--EVVELIVKYSNLQARX-----K--GV
 HsaPGBD3P3 TEPPNDFFTEMXTPTIEILERFLDD--KVVELIVRYSNLHARS-----K--GV
 HsaPGBD3P4 TESPNDFFTKMRTPIEILELFLDD--EVVEFIVKGSNLCARS-----K--DV
 HsaPGBD4 TPGRKVDVSDITDPLQYFELFFTE--ELVSKITRETNAQAALLASKPPGPK--GFSRMDK
 DpuPokey5 -----EATNDYIAEFWSS--RKTPPSRKVGKPEGRLIG-----PRLPA
 CinPBD1 ---VMESGMDGVTPLDYLAMFLSA--EFWDLVVTETNRHAAQTLRKK--KLK-KGSNLR
 CinPB1 SGYGGDLVLADSTPLDLLGLFLTN--EFWQLLVDIFKSKLTSYLQKQTDLP--KFSKFRK
 CinPB2 -----SPITYFMQFFPE--SLIRTIIVEQTNLYSTQ-----K-IGV
 CinPB3 GPSSHACVSNDDSPLEYFRLIFTD--ELLTLVVEETNRYYAAQYLQKTSLS---SKSRAHK
 CinPB4 GPSSHACVSNKDSSYECFRLIFTD--ELLTLVVEVIIRYASQFIZKTSLT---PKFRANK
 CinPB5 -----AHTLDNKTPTPS-----SRLQR
 DmeCG9839 QQSGLKFGQRFQGPQHYFNQVLGNSKFFSSLAQSCNLKGGE-----LK
 DmeCG13151 QACGKGPARTVSNAVEAWMLLFD--EMLRSLLRHINEQMRKRR-----TATSV
 DmLOOPER1m -----DIKTTVEFFYTLFDT--QLIHLMARQTDIYSLQEHG-----I
 NhaPB LPPTPLQLFQLFLPIISLVEKWVSYTNSWITCLKENGVDVSWNNPMG-----KTSYLHK
 OsaPB -----SASSSFAYLPL--SFWKAVLGETNKYAAAS-----PAK

TniPB FRDTNEDEIYAFFGILVMTAVRK---DNHMSTDDLFDRLS-----SMVYVSVMSRDRFD
 BdoPB FRDTNEDEIHALFGILVMTAVRK---DNHMSTDDLFDRLS-----SMVYVSVMSRDRFD
 AgaPB1 NWTLFAEAEFLAILYIRGATE---SKGMEIDLMWSEKYG-----LPFCKNVMSRNRFR
 AgaPB2 WQPLTPSELDAYIGILIEAGVTH---SNDLALEELWKTNS-----HPLFRASMLKRFI
 AgaPB3 WNPLTTNEFDAYLGILLEAGVTC---SNHVHAADLWKTNS-----HPLFRASMSLNWFW
 AgaPB4 WKTLTKSEFEAYLGIILLAGVMR---SNYVHSTELWKTSS-----HPIFRATMSLQRF
 AgaPB5 WKPLTSSEFDAYIGLILLAGVX-----YMPVTELWKTSS-----HPMFRASMSIQRFW
 AgaPB6 WTPTNEHEVKKIIGILIWLG--FF---QF-PLEKYWSESP---IFNFSFLKKLISRQRFQ
 AgaPB7 WTPTNEGEIKKLLGILIWMG--FH---QL-PMKKCWSTNE---MYNFSFLRNIMCRIRFE
 AgaPB8 WKPTNSAEMKKFLSLLLWMG--LV---KVPVNYWSKNT---LYNFKLPTVMSRNRFE
 AgaPB9 WVATDQEQEIKRFFGLTWYDC-----XPPLRLYWSDDP---AYVQTFPKSAMSGERYA
 AgaPB10 WYPTNKDEIKKLFGLPIWMG--LV---KLPEIRLYWSTKP---IYAQSFPKIMSRRDRFE
 AgaPBD1 ANPTDEMEIMALLGVLYIAGTVR---DGRENIERLFDTKMG---TGLEAVYLTMTSLRYH
 AgaPBD2 WLETNPKEVRKFIGLMIWMD--LV---RVGRLEDYWSESA---LYNFAVPRAAMYRERFR
 AgaPBD3 YRKVTVAEMKRYVGLLLVMG--QV---RKDCQHCYWSTNP---LLETVPFANTMSYKRFQ
 BmoPB1 WKDVTSDIYGFVXVLMQLSL--VI---DYVEREYWYAVIE---ELQIGNFKEIMTYNRFI
 Pigibaku1 WKELDQTLHAYFGVLILAGVFR---SKGESAESLWDAETG-----REIFRATMSLENFH

Pigibaku2 WKKMDETDLQAYLGLLILAGVYR---SRGKAAASLWDAESG-----RPIFRATMPLKHFH
 Pigibaku3 SVNTTAKEIEQVLGMYYMHMG-LV---QMPCVRAYWEMET-----KLPVAVCDVMSQDQFL
 Pigibaku6 GKPVNQTDLHGYYIGMMLLAGGYM---SKGEATTRLWKEENG-----RPIFHAKMX-ETFH
 Pigibaku7 LLKTSVDEVYHFFGACILMS-CV---PYPKMRMYWSKSLR-----FTSITDRFTRDRFF
 TruPGBD1 ALNLDLDRPELEQFLGTVVYMS-IF---LLPWSRMYWSSTS-----RVQQAQAEVMSRDRWE
 TruPGBD2 WHTVTREDMYSFSLVLYMG-MV---PLKAMTDFWKGSK----LYRLPFPSVMSNRFL
 TruPGBD3 WHPTDVREMKAYVGLNILMG-IN---QLPDTGMWASDIFIG---NAGFKKTMARRFE
 TruPGBD4 WVPVTNSEIRGFIGLIILMG-IK---NLPDLSQYWSWTHN---DNSYTFYQTMSLIRFR
 TruPGBD5 WHPVTAEEEMKAFGLGVTSTST-IH---RCESVLSIWSSGF----FSNRS-IALKMSQSRFE
 HsaPGBD5 WVEVTLTEMKAFGLGYMISTS-IS---HCESVLSIWSSGF----YSNRS-LALVMSQARFE
 Mmupgbd5 WVEVTLAEMKAFGLGYVISTS-VS---HCESVLSIWSSGF----YSNRS-LALVMSQARFE
 Mmupgbd1 SLEVTVQEMRCVFGVLLLSG-FM---RHPRMGMWYWEIS----DTDQNLV-RDAIRDRRFE
 Mmupgbd1p SLEVTVQEMRCVFGVLLLSG-FV---RHPRMGMWYWEIS----DSDQTLV-RNEIRDRRFE
 HsaPGBD2 NLSLTAQELKCVLGILILSG-YI---SYPRRRMFWETSP---DSHHLV-ADAIRDRRFE
 Mmupgbd2P TLNLMTQELKCVLGILILSQ-YI---SYPRRLVFWETAP---DSHRLV-ADAIRDRRFE
 HsaPGBD3 HLGLTSSEFKCFLGIIIFLSG-YV---SVPRRRMFWEQR---TDVHNVLV-SAAMRRDRFE
 HsaPGBD3P1 HLGLTSSKFKCFLGIIIFLSA-YV---SAPRRRMFCKQR---TDAHNILV-SAAMRCDRFE
 HsaPGBD3P2 HLGLTSSEFKYFLGIIIFLSG-YI---SVPRSRMFWEQXNKPDHNVLV-IAAMRRDRFE
 HsaPGBD3P3 QRGLTSSEFKCFLGIIIXLND-YI---SVHRRHTFWEKR---TDAHNILV-CAAMRCDFE
 HsaPGBD3P4 HLGLTTSKFKSFLGIIIFLSG-YI---SVPRRHMFGEQX---TDAHNVLAZCTAMRRDCF
 HsaPGBD4 WKDTDNDDELKVFFAVMLLQG-IV---QKPELEMFWSTRP----LLDTPYLRQIMTGERFL
 DpuPokey5 GGFVTDHELVAFFGIQFLIG-YH---RLPELSMFWEQQPD--AGLGLGIIQQAMTRERFK
 CinPBD1 WKDTTVAEMKAYFAILLSMG-LC---NTVDMQDYWSASW----ITVTSSISKIMSRVRF
 CinPB1 WSPVTHADIKAYFAMNLLMG-LC---SKHSIKDYWSMYS----YTNTAGISSLMRDRFQ
 CinPB2 SINTNYSEICMFIAIQIKMS-IL---HLPSYLMYWSKEM-----RFPPIADSIKRYQ
 CinPB3 WKPVDAAEELSLFLGLTLLTGTVH---KRGKLESYWIKN---MIETPYFGKCMSRNYQ
 CinPB4 WKPVDAGMCLFLRLTLVT--SI---KRRNLGSKWSKDS---MIEX-YFGKISIXIZYQ
 CinPB5 WKDTNIPEMKAYFVLLLTMG-LC---HKPDINDYWSAFS---VTLTSGYGKIMSRNRF
 DmeCG9839 SNPTTAEEMEIFMALSLLMC-FL---KLEHLSDYWSTNMFY---LVFGSGKIPLERYQ
 DmeCG13151 QRPLDVVELRAFLGLSYLCGVFRNARHNGPLDELWTLELG-----NAIFRASMRLARFE
 DmLOOPER1m ELKCTDEEIKRYIGILLYFG-VL---KLPQFRMAWSKDLK-----ITAITDSMPGRFK
 NhaPB WEGTTVSEVLTMIGVLIYMDVHK---EKTIRS YWNPPKPG-VQRPAHSFIKFI SYNKFQ
 OsaPB GKTVTLEELMRFFGIMFYMT-IV---DKGEYSNYWGEQVED----EIFGVTSTLGLEKLM

:

TniPB FLIRCLRMDKSI RPTLR--E-----NDVFTPVRKIWDLFIHQCIQNYTPG--AHLTI
 BdoPB FLIRCLRMDKSI RPTLR--G-----NDVFTPVRKIWDLFIHQCIHNYTPG--AHLTI
 AgaPB1 EIMKFLRFDEKSTRSQRLQ-----TDKFALISDVFSRFVSNQCNTNYVPG--PHISV
 AgaPB2 SITRFIRFDNGSTREQRK--K-----TDKAAASIQIFGILNTNLNSCYKPR--NNLTI
 AgaPB3 VINRFIRFDDSRTRTERK--K-----EDKATAISGVFGMLLKNLQSCYIAG--MNVTV
 AgaPB4 SINRFIRFDDRRRTREVRK--K-----MDKAAASIDIFAMLNRNLQACYVAG--SHVTV
 AgaPB5 SISRFIRFDNGQTRQQRK--T-----MDKAAASIDVFQMLYANLKSQYVPG--TNVTV
 AgaPB6 LIMS NFHLS DNERIESPTRL-----DKISPLVQLLINNYQAVYTPG--KDIVI
 AgaPB7 LLLSNFHLADN-STDSQNRL-----YKIAPLIEMLLQNYQTIYTPG--KDIVI
 AgaPB8 ILLSNLHFTDNTSISPKNRQ-----GKIINLMDKLQEKYQKVYTPG--ENIVI
 AgaPB9 HLLHMIVFCNXSSQEQLN-----RPFLSKIQPLVDTLQANFKKHFVPTTEEDIIV
 AgaPB10 ILLKMLHFSNNELEVKSD-----RLSKVSYIIKALNQNFKQYDPP--ETVSI
 AgaPBD1 FLIRSI RFD DPTAAPDEIE-----GDKLAPIRPIYERIVSNQCQYLRPG--RFLML
 AgaPBD2 ALLGAFCFYDDGTSKTDYKEP-----GKIGAFIDVLQSKFQALLHLG--EDVVV
 AgaPBD3 QISHYFHGMKQANR-----TYDAKPVLDHLVPKFQALYAPK--QQLIV
 BmoPB1 VIKRCLHFIDNATL PVPPT-----KLDKIIPIIEHLNKKFKSLYVLE--QNIAI
 Pigibaku1 IISRIIRFDNZDDRPARW--Q-----RDKLGVIRTVDKQWVRLPLLYNPG--PNVTI
 Pigibaku2 TYSKLLRFDDRESRPAR--V-----TDKLAAIRDVWDKQWVWLPYLYN----TMVPP
 Pigibaku3 KLLTKIHFKNL SVSDDAK-----KDKLWKL RPWLQKLRDQFLCIRPEE--CHA VD
 Pigibaku6 MILRVIRFNNH DTRLGDV--K-----KT-----NYKQRYVGZMGZNYLVV--QACSP
 Pigibaku7 KLRQSLKVLIDDDVPEDLR-K-----SDKFWKVRPFLDRILQCCRSQTRPE--CVSID
 TruPGBD1 EIKHFIFHCDNSAPNND-----DRLFKIRLVIDSLLPKFQALPQHQ--MLCVE

TruPGBD2 AISRSLHINDPAVETANDLKKGTPG---YDKLCRIKPLYEQILAACYTFFHPY--QHISV
 TruPGBD3 KLTQYLQLCDREFEPGRGERG-----YDGLFKVRPLLDVVENTMWDAYVPN--RCLTV
 TruPGBD4 QIAANIRMGSVTTAECRGAQS-----SDALSIFRPMLEILGGAMWSTYQPN--CSLAV
 TruPGBD5 KILKYFHIVAFAFR----PSQGS-----NQGLYKIQPFLDSLQQSFSHTFRPS--QTQVL
 HsaPGBD5 KILKYFHVVAFAFR----SSQ-T-----THGLYKVQPFLDSLQNSFDSAFAFRPS--QTQVL
 Mmupgbd5 KILKYFHVVAFAFR----SSQ-T-----THGLYKVQPFLDSLQSGFDAFAFRPS--QTQVL
 HsaPGBD1 LIFSNLHFADNGHL-DQ-----KDKFTKLRPLIKQMNKNFLLYAPLE--EYYCF
 Mmupgbd1p LIFSNLHFADNKHLDQ-----KDKFSNLRPLIKQM-KNFPLVCPPE--EYYCF
 HsaPGBD2 LIFSYLHFADNNEL-DA-----SDRFAKVRPLIIRMNCFQKHAPLE--EFYSF
 Mmupgbd2P LIFSYLCFMGNSGLYDE-----SDRFAKFRPLIVRMNCHFQKHAPLE--XFYSF
 HsaPGBD3 TIFSNLHVADNANL-DP-----VDKFSKLRPLISKLNERCMKFVPNE--TYFSF
 HsaPGBD3P1 TIFSNLDVADNANL-DP-----MDKFSKLQPLISKLNERCMKFVPNE--TYFSF
 HsaPGBD3P2 TKFNSLHVADDANL-DP-----MDKFSKLRLLLISKRNERCMKFVPNE--TYFSF
 HsaPGBD3P3 TIFSNLHVADNANL-DP-----MDEFSKLQPLISKRNERCMX-----
 HsaPGBD3P4 XTFSNLHVADNANL-DP-----MDQFSEWZPLASKLNERCMKFAPNE--TYFSF
 HsaPGBD4 LLFRCLHFVNNSSISAGQSKA-----QISLQKIKPVFDFLVNKFSTVYTPN--RNIAV
 DpuPokey5 FISKHIAACASPWDDVDPNSDDPDQEPERPDPIRKIRPLVKRLNERYHACRKP--RGQSI
 CinPBD1 LIRAMLHFCNDEESSKNSQK-----HNRLFVKRQLIDVLVPKFSALYKPD--KELAI
 CinPB1 SIRAFHLHFNNENYIPRGQPG-----HDRIFKIRNIVELVTKNFSKHYTPH--KELSL
 CinPB2 KLRRFLHFVDNSTFNSD-N-----PNKLFKIQPVLDAVRNECIKIQPEQ--SHSVD
 CinPB3 AITGFLHFNDNEKLAENIDND-----KLYKVRPVYDLIVARWKALYNLG--EHISI
 CinPB4 VITGFLHFNDNKKLPENIDND-----KLYKILSVYYLIVARWKSLYNFG--DHISI
 CinPB5 LIRSMLHFCNNEDFIPRHEEN-----YDRLFKIRRLVDIIVPKFDQVYKPK--KQLSL
 DmeCG9839 QLLHCLNFDAPQLQAGRAK-----VKNSLLLDFFINERMEEIYICG--QQLVL
 DmeCG13151 SISECLAGNCGWSEGQK-----LWQRLIINCRSYYGCS--SWLTV
 DmLOOPER1m KIKQCLHFNDNAKQLKKGDCN-----YDKLYKIRPLLRILKXILEKLTQEE--HQS
 NhaPB LIHRRLRPFHDHTKYDETAPIP-----KVFCQVEEWSDHIAVSMQIFLPG--SHLAV
 OsaPB TLKRFYIRKNLCFRYDISKADLK-----KDPAARIRPLINMIKHTSLKYVVLG--RNVAV

TniPB DEQLLGFR-----GRCPFRMYIPNKPSKYGIKILMMCDSSGK-----YMINGMPYL
 BdoPB DEQLLGFR-----GRCPFRMYIPNKPSKYGIKILMMCDSSGK-----YMINGMPYL
 AgaPB1 DEQLFPSK-----TRCPFTQFMASKPKDYGQKYWMAVDVDSK-----YVNNIIPYL
 AgaPB2 DEQLFPYR-----GGTGFTQYIPSKPAKYGIKIWWICDSESS-----YPLKGQIYT
 AgaPB3 DEQLFPYR-----GGTGFTQYIPSKPAKYGIKLWWACDAEPS-----YPINGQIYA
 AgaPB4 DEQLYPYR-----GGTGFTHYIPSKPAKYGIKMWWVCDAVTS-----YSIKGQIYT
 AgaPB5 DEQLFAFR-----GGTGFTQYMPSPKPAKYAIKVZVWCTLZKAKYIQAWQYQVNRZLYN
 AgaPB6 DESMVPFK-----GCLIFKQYIPTKAHKYGIKLFKLCCT-E-----GYTWSMKVYA
 AgaPB7 DETMVPFK-----GRLIFKQYIPSKAHKYGIKLFKLCCT-E-----GYTWSLKVYA
 AgaPB8 DETLIPWR-----GRLIFRQYIPSKAHKYGIKMFKLCSS-E-----GFTWASKIYS
 AgaPB9 DESLIPGX-----RGRTAFRQKQPQYQQGGNKVFKLCCGT-----GYTYALRVVC
 AgaPB10 VESLIPFR-----GRIVFRQYLKKNRHKYGTIKLFKLCFGY-----GYTYNCSFYA
 AgaPBD1 DEQAVQFK-----GKCEFRQILPSAPGRAGFRFHLVDCETS-----YVSNLEICV
 AgaPBD2 REMLALGR-----DRTSFKQYIPASAHRHGRWALFKLCSL-E-----GYTWGLKLCCT
 AgaPBD3 SELTIPODVLNGQOTEPPNHSEDAQGSTPESAKRLRLLCESDTG-----YVLNVELAN
 BmoPB1 DESLLLWK-----GRLSFAQKIATKRPRVG-IKSYELCESRT-----GYLWQMEVYT
 Pigibaku1 DEQLMPFR-----GRCPFLQYLPSPKPAKNGIKIWAACDATSS-----YAWNLOVYT
 Pigibaku2 RGNLFTYFXCLL-SKGRCPFRQYMPSPKPAKYGIQSWVACDAKSS-----YAWKMQVYT
 Pigibaku3 EIMVPFKG-----K-SHLRVYMPAKPHKWSFKMWGRAGQS-----GFLYDFDVCQ
 Pigibaku6 -----YCVPYTQYIPSKPAKYGMKIGAACDAESN-----YAWNMQVCT
 Pigibaku7 EQMMVPFT-----GACPCRQYLPMLNVPVGIKNFICATTD-----GIVLDFDLYQ
 TruPGBD1 KQMPVPFKG-----R-SALRQYSPQPKYKGYKLFVLCDDT-----GLVHSFEIFT
 TruPGBD2 DERMVATK-----ARIGLKRYVRNKPTKWGIKLFVLADSSCG-----YTLNFFVDA
 TruPGBD3 DKCSIVTK-----GRFSPAQYMPAKPLRKGLTVWMLCDSRSG-----YCHRAKIYV
 TruPGBD4 DRALLPSLE-----EGRLKEDAKVQPEVWLLCDSKSG-----YCHRLSIQV
 TruPGBD5 HEPLIDEDPV-----FITTCETERELRKRKRKFSWLVWRQCTS-T-----GFICQISVHL
 HsaPGBD5 HEPLIDEDPV-----FIATCETERELRKRKRKFSWLVWRQCSS-T-----GFIIQIYVHL

Mmupgbd5 HEPLIDEDPV-----FIATCTERELRKRKRKFLWVRQCSS-T-----GFIIQIYVHL
HsaPGBD1 DKSMCECF-----DS---DQFLNGKPIRIGYKIWCSTTTQ-----GYLVWFEPYQ
Mmupgbd1p DKSMCECF-----DC---DQFLNGKPLQIGYKIWCSTTXQ-----GYLVWFEPYQ
HsaPGBD2 GESMCEYF-----GHRGSKQLHRGKPVRLGYKIWCSTTSR-----GYLVWFEPYQ
Mmupgbd2P GESICEYF-----EHWGGGWVGGVQASALR-----EASR-----GYLVWFEPYQ
HsaPGBD3 DEFMVYPYF-----GRHGCKQFIRGKPIRFGYKFWCGATCL-----GYICWFQPYQ
HsaPGBD3P1 DESTFPYF-----GRHRCEQFIGGKPIQFGCKFWCGATCL-----GCICWFZPYQ
HsaPGBD3P2 NESMVPYS-----GCHRCKQFIQGKPIFMFGCKFCCGATCL-----CHICCFQPYQ
HsaPGBD3P3 DESMVPYF-----GRHWCX-FTQGKPVLFYKFWCGAICL-----GYICWFQPYQ
HsaPGBD3P4 DESRVYPYF-----GCQGCKZFIWGKPIRFGCKIWCSTTCL-----GYIXGFQLYQ
HsaPGBD4 DESLMLFK-----GPLAMKQYLPTKRVRFG-LKLYVLCESES-----GYVWVALVHT
DpuPokey5 DESMVKFK-----GRSVLRQTMKNKPIKSGFKIWSRCCHR-----GYTYKFEIYQ
CinPBD1 HEMTVACN-----YKS--EQRVRRKPIQWTDKVYALTEAR-T-----GYLLEWAIHA
CinPB1 DEMTIAYK-----ERSSIKQYNPIKP-----KVFFVLSEAR-T-----GYALQWDLTY
CinPB2 EQIIPAKT-----KYSKFRQYNPKPKVWGFKNMVRADSS-----GFMYDFYIYG
CinPB3 DEGMMKWR-----GRLGFRVYNKDKPIKYG-IKSYILADSHS-----HYCWNLDMY-
CinPB4 DEGMIKZR-----GKLGFRVYNKNKPIKYR-IKSYFLAD--S-----HYCWNLGMY-
CinPB5 DEMTIAFK-----GRSTIKQYNPHKPSKWGYKVFALTEAT-T-----GYLLQWEMYA
DmeCG9839 NEPITLWK-----GALRYQDELPNKFRTNALLLHMLTEQS-----GLVVKILPEI
DmeCG13151 DETFCAVA-----KSRMTLCCDARTLYMANAVVS-----
DmLOOPER1m DEQIIAFKG-----TFLIFFXSKPHKWGLKMFTRAGIS-----GLVYDFTLYV
NhaPB DECMIRYT-----DRSDDITVIKSKPDPVGFKIWVIAQYG-----FFIRWIWHV
OsaPB DESSIACRS----KFRGHMIVYNAKKTGKFFHKIYACCCATTW-----LMVGFRLHC

TniPB G-----RGTQTNGVPLGEYYVKELSKPVHG---SCRNITCDN--WF
BdoPB E-----RGTQTNGVPLGEYYVKELSKPVHG---SCRNITCEN--WF
AgaPB1 GKN-----DERPAEERLGDVFKVKKLVDPYLN---RGRNVTCDN--FF
AgaPB2 G-----LSPSGEREKNQGERVVKDLCHQFRR---SGRNITCDN--FF
AgaPB3 G-----LSPSGIREKNQGERVVKDLCRVFRG---SGRNIIICDN--FF
AgaPB4 R-----LAPSGQREHQQGERVVKDLCRIFRG---SGRSVICDI--FF
AgaPB5 LSYSLKKLREIZCFLFFFLFKTSGERERNQGERVVKDLCDMFRG---SGRNIVCDI--FF
AgaPB6 GKN-----DKEKTKLGVGTNVCFELAEKLM---NEGRTLYIDI--FF
AgaPB7 GKN-----NMCKTKMGLGSNISVELANNLM---HEGRTLYIDN--FF
AgaPB8 GKS-----SEGIRETGL-AHVCIKLAEKLF---EKGRTLYVDN--LY
AgaPB9 T-----KKAQNESTTDDVIVSLCEALFN---GGHTLYTDS--RY
AgaPB10 G-----KIHEKEKTPVNVVMKLSEKLLD---KGHTIXAQT--IG
AgaPBD1 PEN-----QNPYNLSYAPTDVAMRLTEPVQG---RQKTIVILGAG--L
AgaPBD2 EQR-----LIG--EAQLANSVCMELCEPLL---NQGRVYIDN--FH
AgaPBD3 -----QQLDQVALTDVSIVRPYFG---RWHHVYWGN----
BmoPB1 GKGHAHVVDGEP----EERGQESDEPESATAQIVLNLTRPLF---DKGHTLIMDN--FY
Pigibaku1 G-----KPDGGAPEKNPRNESCPRHVSGTQ----WTQHMRH--FF
Pigibaku2 G-----KPTSGCPEKNQGMVVLDVTEGLR----GYNVTCDN--FF
Pigibaku3 G-----AQNPESKSEVGVTEVVLKMTSTLP--AGKNHKVFADN--YF
Pigibaku6 G-----KLPGFTESEKNQGRYVLEMSSESQ----GHNITCDN--FF
Pigibaku7 GSGALR-----EQVEEPEGLSLGSLAMARLCQTLHR---GTKVYCDR--LF
TruPGBD1 G-----EIGPAPGQPDIGASGNIVLKLAVIP--QNVNHLLYFDH--WF
TruPGBD2 GKD-----PEPTGKGRSYDIVMRILNVPFLG--KGYKLYMDN--FY
TruPGBD3 GRP-----VDDEVAASVGYRAVTSLVRGLEG---QFHHVFMDS--FF
TruPGBD4 G-----EKVQQGQGCTVVSELVKGLEG---KHHHLYLAN--SL
TruPGBD5 KEGQG-----SDGLAALKNKPLHSLVAKQLCQNIS---GKNSIIIFTG--PSM
HsaPGBD5 KEGGG-----PDGLDALKNKPLHSMVARSLCRNAA--GKNYIIIFTG--PSI
Mmupgbd5 KEGGG-----PDGLDALKNKPLHSMVARSLCRNAA--GKNYIIIFTG--PSI
HsaPGBD1 EEST-----MKVDEDPLDGLGGNLVMNFADVLLERQYYPYHLCFDS--FF
Mmupgbd1p EDS-----GVDKELDLGPGGNLIMSFADVLLKGGHPYHLSFDS--FF
HsaPGBD2 GTLF-----TKPDRSLDLG--GSMVIKFDVALQERGFYPYHIFFDK--VF
Mmupgbd2P -----KPDRLDX---ASMVRFVDALQEHSLPNHIFFDK--VX

HsaPGBD3 GKN-----PNTKHEEYGVGASLVLQFSEALTEAHPGQYHFVFN--FF
 HsaPGBD3P1 GKN-----XNTKHEEYGVGASFTLQFREALIEAHPGQYHFIFDN--FF
 HsaPGBD3P2 GKN-----PNTKHEEYGVGASLIHKFSEGLX-THPGQYHFVFDN--FF
 HsaPGBD3P3 GKN-----PNTKHZGYGVVESLVRQLSEALTEAHPGQYHFVFDN--FF
 HsaPGBD3P4 GKN-----PDTKHEESGVGASLVLHFGEAITETHPGQYHFVFDN--FF
 HsaPGBD4 GPG-----MNLKDSADGLKSSRIVLTLVNDLL---GQGVCVFLDN--FN
 DpuPokey5 GARFG-----EKQGRSRNNEAVERVVVLDLQPLTD---QGFVVAFDR--FF
 CinPBD1 GSS-----RETEKGAS----IVRKLCTRYI---GK-HDIYINTANSY
 CinPB1 GKS-----EDVDSVSKTHAIVRKLKSQEYL---HKGHDIYMN--SYY
 CinPB2 GKDSK-----QLALSDDATHLQKSAQTVVKLCQHLP--VKQNHQLFFDN--WF
 CinPB3 -----HRVQKTLKETVSQILTSKCH---FLWHSLYMDN--FY
 CinPB4 -----HRVQNXLKETVSQLLTZ-----LYMDN--FY
 CinPB5 GSS-----METDEDVSKTHSIVRKLCSGYM---GKQHEVYMN--SYY
 DmeCG9839 VRKED-----APAWVRNSRQLVEHRNKIVLKLMEGYHG---GRTVYTSK--FY
 DmeCG13151 -----RNQRCPKDVEQLICDFKT---TGRNVTLGS----
 DmLOOPER1m GEG-----TSPSYGLGISSYVVLVLAESLPK--DKNFKLYFDN--WF
 NhaPB K-----EKPHGAVGVEFQLRSHHHKVG-----
 OsaPB DSDMEDRLRDVIP-AVDAQNLNRLQFSSSVRQIVLEVTRPIHN---TQRVVNTDN--WY

TniPB TSIPLAKNLLQEPYKLTIVGTVRSNKREIP---EVLKNSRSRPVGTSMFCFDGPLTLVSY
 BdoPB TSIPLAKNLLQEPYKLTIVGTVRSNKREIP---EVLKNSRSRPVGTSMFCFDGPLTLVSY
 AgaPB1 TSLELA--KFLKSKKTSLVGTINKARREVPICVKKVKEKLYFTKAFKSD-----DTTLTV
 AgaPB2 TTFNLAKTLMQD-YKLSILGTVNKRRTFVP---FELMVTKGRETESTKVFVQNNVTMCSY
 AgaPB3 TSYNLAISLMED-YKLALLGTVNKRRTFVP---SSFNSPKGREVLSTLFGFSENVAICSY
 AgaPB4 TSYNLASSLMPD-FKLALLETVNKRRTFVP---PMFANPHGREIQSTLYGFSENISICY
 AgaPB5 TSYNLALSMLD-YKLSILGTVNKRRTFVP---AFFVKPKGRIPESTLFGFSENVCLCSY
 AgaPB6 TSYELA--LKFLQNKTHVVGTLRFNKKYMPKVMVSKLK---KGEMISK---EDPNGIVV
 AgaPB7 TSYELA--IQCLK-KSHVVGTLRYNKKYMPKVMMDKPLK---KGEMVSR---EDPNGIVV
 AgaPB8 TSYELA--LTCLDRKTHLVGTLRHNKKSMPRDVLDCKLK---KGEMIX-----VGIVV
 AgaPB9 TSLSMA--TKLLTKRLHLVGI FNPGRPGNPPAVVSKQLAAGETFAMEKS-----KSITV
 AgaPB10 TLYELYEAIEKIIRKCLKVGEFI AKENS-----NGITV
 AgaPBD1 TSIDLI--EKLYASRTMAMGEVPKSYPLPKALIANKGRPEHSTLAAYHD-----PATLV
 AgaPBD2 ASFDLA--QALLANQTHLVGTVRVNGSSMPKDVLLAKLR---KGEI IAR---ENDDGVMV
 AgaPBD3 DGITVAAAETLYANQTLACGTLRNDPDGTVAPERK-----SPVLV
 BmoPB1 NAPLLSR-ILKVQHKTDSMGTLRNLNREFVPEALKKKTKKNMKEGEVAFS---TT-KDLSV
 Pigibaku1 TSHKLGQELK--RKLTVGTVIRKRNSELP-PQLLTSKNR--PVKSSQFAYTADTSLVSY
 Pigibaku2 TSYELRQQLK--RKITMVGTVRKNKPELP-PALLASKRGLLIKVSLHAHHHS----SF
 Pigibaku3 TSVPLV--QHLKERGIHYIGTIQINRVKDCAMMDEKELKKNRGRSMDFR---VNQDNII
 Pigibaku6 TSYHLGDEHQK--RKLTLGTVSRKKPELPRESSXILKMQVRPLHSSIFAFTEKATVVSY
 Pigibaku7 TSIQGA--EZMMKKEYMTGTVMKNCSIAEVTYXDKSMQNAAGRTSSTEV--TEDGKLCV
 TruPGBD1 SSLDLF--VALANKGIPALGTIQQNRLRGCTFSADSEMKNKDRGAFEEQAVVDDVGIRV
 TruPGBD2 TSPTLFR--DLLSRKIWACGTLRPNMAGYPKKKGNMDTKTTPRGTI RWMR----QGELLF
 TruPGBD3 TSVPLL--QRLLRNGIYACGPTQPGRKGYPEVLRPRNIGKLSQGEFYQCQ-----RGNLV
 TruPGBD4 ASVPLL--QKLLDQGIYASSFPQFSPILPRELWEEGSLDKPGDFHQKQF-----GPLLV
 TruPGBD5 TSLSLF--SEFSEQDIFCCGLLSTRKSDCTGLPQSMVLCGSTPAQRGQSR-IMMKGSLSL
 HsaPGBD5 TSLTLF--EEFEKQGIYCCGLLRARKSDCTGLPLSMLTNPATPPARGQYQ- I KMKGNMSL
 Mmupgbd5 TSLNLF--EEFEKQGIYCCGLLSTRKSDCTGLPPSMLTNPATPLARGQHQ- I RTKGNMSL
 HsaPGBD1 TSVKLL--SALKKKGVRATGTIRENRTEKCPMLNVEHMKMKRGYFDFR--IEENNEIIL
 Mmupgbd1p TPVKLM--SALKKKGVKATGSLCENKTXKCPMLNVELMCKMNXYGDFDI--VEEKEEIFL
 HsaPGBD2 TSVKLM--SILRKKGVKATGTVREYRTERCPLKDPKELKKMKRGSFDYK--VDESEEIIV
 Mmupgbd2p TSVKLM--SILRGKGVKATGTVCEYRIERCPLKDPKELRKRTRYSFHYR--VEESQEIIV
 HsaPGBD3 TSIALL--DKLSSMGHQATGTVRKDHI DRVPLESDVALKKKERGTFDYR--ID-GKGNIV
 HsaPGBD3P1 TSIALL--DKVSSMGHQATGTVRNDSTDKAPLEZDIVLKKKERGTFDYL--ID-GKGNIA
 HsaPGBD3P2 TSIALL--DKLSSMEHQATGTVRKDRINKAPLESDVALKKKE- I IFNYG--ID-GKGNVV
 HsaPGBD3P3 TSI VLL--DKLSSMGNRATGTVRKDHI EKAPLKL DVALKKKEXGTFHYZ--ID-GKGS LV
 HsaPGBD3P4 TSIALL--DKLSLMGPQATGTVRKYCIDKAPLESAAALKKXDRGKFDYR--ID-GKGSTV

HsaPGBD4 ISPMLFR-ELHQN-RTDAVGTARLNKQIPNDLKKRIAK----GTTVAR---FC-GELMA
DpuPokey5 TSIALL--DKLRENGVNAVGTILPSRVNQPIMTKNESNLRPDEFAAKFGG-EPGTCRKG
CinPBD1 TNRNLA--KEFVSQTNGSG-----GIPGELKTINEKNNP-----
CinPB1 TNPYLA--NELSKLKTGVCGTISATR---KGMPELKKKLNKTKKGGDDPI-FLRSGDLLA
CinPB2 TTLDLL--IYLKEIGINACGTIRGN-----EDLKKNGRGAVDFR--SDFNSGILV
CinPB3 NSVSMS--QMLLAFQIHSVGTILRSNRG-EPREIRTPPNQ-MKKGDI IAR---QN-QSVTV
CinPB4 NSVSMS--QIXLAIZIHVVTLRSNRE-EPCEFZTPPIQ-MKKGDI IAR---QN-KSITV
CinPB5 SNPYLA--KEFKEKKTGICGTINCNR---KGMPELKKKLNKTKKGGDDPV-YMLSGDILC
DmeCG9839 GSYGLA--QELAKKSTYCTGLLDRNRYGNSKALVHQRLDSNSISTSYATS-----LMM
DmeCG13151 RYLNLTQCEQLAQRQISSLGKLEANSPhWPRQWPTESPLFGGSSKLIPLD---GDAVFC
DmLOOPER1m TSVILL--ISLKEIGIFATGTVRMIKX-----QPVVI
NhaPB -----QASEEKSQSKPLI-----
OsaPB TSVTLM--LSLRDVGLYGRGTIRENSAHFPAKHMFAKKANEPRGSSSLQG--VSNTGQMIA

TniPB KPKPAKMV-YLLSSCDEDASIN-----EST-GKPQMVMYYNQTKGGVDTL
BdoPB KPKPAKMV-YLLSSCDEDASIN-----EST-GKPQMIMYYNQTGGVDTL
AgaPB1 YQGKTKKNVLLSSMHRDIRTG-----NDKKSKEPETVAFYNSTKYGVDDV
AgaPB2 IPKKNRSV-LLISTSHYDTKTH-----GPK-KKPTMMLDYNKYKGGVDTM
AgaPB3 VPKNWAV-VLLSTFHYDTEIQ-----GPK-NKPRMIADYNRSKGGVDNM
AgaPB4 FLKKNKSV-VMLSTMDYDKDVQ-----GPK-EKPAMI IDYNKFKGGVDNM
AgaPB5 VXKKNKCV-ILMSTSHYDMEIT-----GPK-NKPKMIDDYNKLGKGGVDNM
AgaPB6 LKWRDVRD-VRMISTKHAPVLVSTTSASKP-----QRTEKLKPVAVIDYNQKCGIDKS
AgaPB7 LKWKDSRD-VRMISTKHVPRMLMPVKSANP-----KSKEKMKPLAVIDYNLKGKCGIDKS
AgaPB8 LKWKDSRD-VRMLSTKHAPYMQVTTKCYSN-----QPATKPKPLTVVDYNKKGKCGIDYS
AgaPB9 LKWKKEQEEVLLLSTKHSFEMMKIECR-----GSSKRKPRIVIDYRRGKAAIDLA
AgaPB10 IKWKNKRD-VLMLSTKHSKDMVIAKIKN-----RYVLKPKI IYLNKSKKKK-----
AgaPBD1 SYVTRRKEVMLLMSSFVDFDSEEQAGEQ-----DEGEQHLKLVELYNRTKTTIRT
AgaPBD2 LKWKGTCT-MGLLSTKHSALVPMSQVRSNRR--WIRVARIQPEAVIAHIQAKGRPDRS
AgaPBD3 MDGQGKRILSTIHGAAMQPTG-----EPQGPPPAADVADLNRLHADLERF
BmoPB1 VVWMDKNI-VAMISSFHPIEVGGIEK-----YGYRYKPKQVVLVDYNFMSGGIDHK
Pigibaku1 VPKKGKNV-VLMSTLHRDGRMC-----DQEHKPEI IMDYNATKGGVDNM
Pigibaku2 IPPKEKQE-CSSSEHTAQIRZH-----ZRSWGQEA IILDYNRNKGGVNLL
Pigibaku3 VRWYDNKA-VNLISSFVGI EPVGNVWRDRKS---KTHIMVPRPAIVETYNKFMGGVDLL
Pigibaku6 FPKQNKNV-XYIEYNPTDVSL-----TREDKPKQTTLDPGQLD-----
Pigibaku7 VKWFDKPP-VLMSAVHGTQPEDTCQRWDKIQ----KKYVSRPSIVREYL-KMGGVDLI
TruPGBD1 VKWFDNRG-VIVASTFAGAQPVS I IERWERKL---KRNVSVECPS I I SLYNKFMGGVDAL
TruPGBD2 VKWLDARQ-VNMCSTMHKAYSNDTAMRKVKNAKGEWTVKRVPIPGCIKDYNQHMGGVDLS
TruPGBD3 ATVTRDLKVVSCSLSTNSAPGIVGISPDQREGE-----AHGDEERDSMESSGASYGHAATF
TruPGBD4 TRWRDMKEMGCLSTNAAPGEHDTVWRRSQTQVG---ELDPVHRPLAFRLQLQENMRGVDC
TruPGBD5 ISWYNKGH-FRFLTNSYSPTRQGM I I KRKSGE-----IPCPLAVEAFAAHL SY I CKY
HsaPGBD5 ICWYNKGH-FRFLTNAYSVPVQGV I I KRKSGE-----IPCPLAVEAFAAHL SY I CRY
Mmupgbd5 ICWYNKGH-FRFLTNAYSVPVQGV I I KRKSGE-----IPCPLAVEAFAAHL SY I CRY
HsaPGBD1 CRWYGDGI-ISLCSNAVGIEPVNEVSCCADN---EEIPQISQPSIVKVYDECKEGVAKM
Mmupgbd1p CRWHGDGF-ISLCSNAVXIEPVSKASCV-ADD---KEXSFLQVTSIVKLCCECRKGVAKM
HsaPGBD2 CRWHDSSV-VNICSNAVGIEPVRLTSRHSGAA--KTRTQVHQPSLVKLYQEKVGGVGRM
Mmupgbd2P C-----HV-VNICSNVVGIEPVVPSHHPGAA---KAQAQVHQPSLVKLYQEKARGVDZM
HsaPGBD3 CRWNDNSV-VTVASSGAGIHPLCLVSRYSQK---LKKKI QVQP NM I KVYNQFMGGVDRA
HsaPGBD3P1 CRWNDNSV-VTFASSGAGIDHLCVSYYSWK---QKKKTQVLQPNMKNVYNWFMGGIDRA
HsaPGBD3P2 CR-----
HsaPGBD3P3 CRWNDNSV-VTVASSGAGIHPPCLVHRYSQNNEZLKKXTQVQPNMIKVYNQCIGSIDSA
HsaPGBD3P4 CRWNDNSV-VTIASSGAGIDPLCLVSSYSQK---LKKKI QGQPNMIKVYNQFMGVIHTA
HsaPGBD4 LKWC DGKE-VTMLSTFHNDTVIEVNNR-----NGKKT KRPRVIDYENMGAVDSA
DpuPokey5 FVWRDTKA-FRVASNYHGSNLVKVRRKQRDGS----FKTKSCPKAIDYVNNMGGVDTA
CinPBD1 -----VCAKSAVRSEI KAKSATQKGNKR---SYNDMKKANSKKRYN-YLSGVIPI
CinPB1 CAWHDVRR-LTMLSTIHNASSTETTIRSKKVDT---GTRTILKPI CVAEYNRHMGGVDRM
CinPB2 TKWYDNNA-VHIGSNFVGI EP MST I DRWSSEI---KEKVPIQCPQIITMYNKGMGVDLA

CinPB3 LAWKDKRV-VKAI STKHDASVTTITRRQRRGG----EXESVEKPVCIADYNLHMSGVDQV
CinPB4 LAWKNIRV-VKAI STKPDASLTTITRZQRRGX----EKESI KKPVCITNYNLHMSGVDQV
CinPB5 CAWHDTKR-LTMLSTIHDAGVSEKSI RSKTSET---GTRMVMKPNVCVTEYNKYMGVDRI
DmeCG9839 AKWRRRAKSLYCFSSDCLAIYSKEMAMQKTN-----AKPKLIQELEFQLRPGNDG
DmeCG13151 CGLSSQVDAVQAYEQTSEACQQFYEH SQRFSTAHATPAPLKKQINPFLQLLHFVFNAAAV
DmL OOPER1m CKRWSPKAKAYIDISG-----PAIVALYNKMGCVDLA
NhaPB -----
OsaPB ASWMDGSA-VNILSNADSSGMGEVTRMIGKER-----VVFPAPKCVAEYNKYMQVDRL

TniPB DQMCSVMTC SRKTNRWP MALLYG--MINIACINSFIIYS-HNVSSKGEKVQSRKKFMRNL
BdoPB DQMCSVMSCSRKTNRWP MALLYG--MINIACINSFIIYS-HNVSSKGEKVQSRKNFMKNL
AgaPB1 DQMCRKYS LKSASRRWSVHSFFN--ILDLAGINAWVLYKELTKEN-----ISRDFL FKL
AgaPB2 DQCLAHFTTKRKT RRWPLAFFYN--ILDIAAYAAYITYMGNNPHFNSTN-YTRRVYLQ QV
AgaPB3 DKCLFEYSCKXEDKSV AISIFYN--ILDVA AFAAYKIYKENNPNLYNAI-NYRRLFLKDL
AgaPB4 DKYLSEYSTKRKTNRWPLAFFFN--ILDRAAFAAFKIYKENNLQNCQST-DYRRMFLQQL
AgaPB5 DKYLSEYTTKRKTNRWPLAFFYN--LLDVAALAAFVLYKENNPQYNTSP-NKRRMFLQQL
AgaPB6 DQMI SYATHSR-RSQKWHKLALYLLTGTSV VNAHIVYQKANNI-----KIG--IREF
AgaPB7 DQMVSNATHIR-RSRKWHKLAMYLLIGTSV VNAHIIYQKINNI-----SIT--IREF
AgaPB8 DQMVSYATTMR-EGVKWYRKLGI ELLLGTSV VNALVVFKTATKR-----NIG--IREF
AgaPB9 DR-MNAYSLTLCKAMQWYRKLGF D LLLNTALANAYLLYKDATN-----KQVSI SEF
AgaPB10 -----
AgaPBD1 QQMCAKHN VVRSTRRWPVAVFFN--LMNLSAINAWCIYCLNHPEEAK---MSRRDFLV TM
AgaPBD2 DAIGPHITDLR-KGMKWKYQVGLV LLLQVCVTNAWILHRMVTKK-----KLK--LATF
AgaPBD3 EGLLVEEYLSNASV GWHIRT VLL--LINVALLNAYILFSQTD TG-----SRFTFN VF
BmoPB1 DQMLSAYPIERSRNI IWYK K LFR-RLLNVS MHNALVMFN-HNRT-----HALRHRE-F
Pigibaku1 DKLV TAYSCKRRTL R WPLVIFFD--MLDISAYNAFVIWMALNPEWKRVK LQKRRLFLEDL
Pigibaku2 DKVIGTYSYRSMTAHWPLIIFHN--IIDVSSYNAFVIWREINPSWMSRKQNKRRVFLEQL
Pigibaku3 DMLSALYKFSF-RSRRWYMYIWW-HTVTVAVINAWKFYRRDQKKL---EPQMKPMGLRRF
Pigibaku6 -----
Pigibaku7 DRMISYYCMSTRTKKWTMRMLMH--FTDLALANSWLLYRKDLTTZ--DAPRKSIMQFLEF
TruPGBD1 DALIAYHRIHI-RSKKYHRLFF-HFVDMAIVNSWLLYRRDCESLG--VPRRKRKDLLAF
TruPGBD2 DALISYYNVLHKT LKWKYKTLFYH--FVDIATVNAF I LHKEMCKLQ-----DRPELQKAF
TruPGBD3 APAAVPGEHEGRRPLRPAEGVLPGGPGRARS GGATSCGSTSTCASSTPTSSSGRAEGARR
TruPGBD4 KQLLACNPLGGIPQDKHWRNLFW-FLVNLSIVNAFIMLRESRKD SPPPWVDGLFTQVIF
TruPGBD5 DDKYSKYFIFHKPNKTWQQVFWL--SISIAINNAYI LYKMSDAYA-----VKR-YSRAQF
HsaPGBD5 DDKYSKYFISHKPNKTWQQVFWF--AISIAINNAYI LYKMSDAYH-----VKR-YSRAQF
Mmupgbd5 DDKYSKYFISHKPNKTWQQVFWF--AISIAVNNAYI LYKMSDAYH-----VKK-YSRAQF
HsaPGBD1 DQIISKYRVRI-RSKKWYSILVS-YMIDVAMNNAWQLHRACN-----PGASLDPLDF
Mmupgbd1p DQXISKYRVGL-RSKKRLWVLVS-YMVDVAMSNAWQLHRICN-----PGSPLDLP GF
HsaPGBD2 DQNI AKYKVKI-RGMKWYSSFIG-YVIDAALNNAWQLHRICN-----QDAQVDLLAF
Mmupgbd2P DQNI AKYKVKI-XGKKWYLSFTS-YVIDAALNNVWQLHRMCC-----QDRQGDLLAF
HsaPGBD3 DENIDKYRASI-RGKKWYSSPLL-FCFELVLQNAWQLHKTY-----DEKPVDFLEF
HsaPGBD3P1 DKNFDKYQAAI-HGKNWYSSXLL-FCFKLVLQNAWZLHKT X-----DEKPVDFLEC
HsaPGBD3P2 -----
HsaPGBD3P3 DENIDKYRASI-HGKEWHSSPLL-FCFELVLQNAWQLYKTY-----DEKPIDFLEF
HsaPGBD3P4 DENINKYQASI-CGNKZYXSPLL-FCFKLVLQNAWQLHKAY-----DEKPVDFPEF
HsaPGBD4 DQMLTSYPSERKRHKVWYK KFFH-HLLHITVLSYI LFKKDNPE-----HTM SHIN-F
DpuPokey5 NQLRSYYERDRKAKKWWHRLLYS--LLETCLVNSWICFN-----
CinPBD1 FRQLN--LFRHKT VKWSLRIFEN--LAQICVNSYI LYTSKTSDS-----SDK-MDLKKY
CinPB1 DQRMKTYIFPHRS HKWYMRIYDG--IISIAMVNAHII SFSCPSSS-----NKKPKSLKQF
CinPB2 DMLISLYRTEV-KTRRWYIKIFW-HCIDIAKVNAWLLYRRHCNEMS--ISKKSQRTLLNF
CinPB3 DQM- ISYYPCHRKSLKWT KKVFF-YFMTISVHNAYI LYKSKSSA-----KSCKTLYSF
CinPB4 DQMKIVYYLCHHKSLKWT KKVFFYFIKISLYNAYI LYKSKSMA-----KLYKILYSF
CinPB5 DQIRTYLFPHR SRKWMRIFDN--LIQICLVNSHVIYNTLPSGS-----NEKKT LK FY
DmeCG9839 RHHLIHYQAACKELKANIKLTI F--LLNILVYNAYLLYFANGQNA R----VGHLKSYSEF
DmeCG13151 NAWILLRLSPKGDAAMDQRDFQRQLGLFLTQORLQRR LQRRSTSTS----LVMRLQICEI

DmLOOPER1m	DMMELYKINNRSTFFIVAWEYSLQKLRYRIGNNSSZZPQNKNIFS--LSNFNRKLP MNF
NhaPB	-----
OsaPB	DQLRAKYSLADGHSMQKWHKKLALAFIDIARVNAYVTKCLRDDKP-----LRNQHRQF
TniPB	YMSLTSSFMKRLEAPTLKRYLR-----DNISNILP-----NEVPGTS
BdoPB	NMSLTSSFMKRLEAPTLKRYLR-----DNISNILP-----NEMPGTS
AgaPB1	GEELAEYVENKSANAN-----LPMTNAGGSRR
AgaPB2	AEQLGMDEIVSRSONAQIMRHFG-----PRSGIESMLGKPINPV--VVNVPHVSE
AgaPB3	CEQLCTKEIQRRSENTQIMRHFG-----PRSGVESMLGQSLASTLRQHVDAYSEE
AgaPB4	SEQLTMPVIQRRSENVQLMRHFG-----PRSGVESMLGGPLIALSKKNTTKDVEE
AgaPB5	CEQLAMPEIEIRSTDIQIMRHFG-----PRSGIEAMKGGPIKSP--DTNETMTPT
AgaPB6	REKIVHEWLCSEYPDIEE-----ENNKNNHYLQKRKNSSNK
AgaPB7	RELVVQEWLC-----LENLKPTPN-
AgaPB8	REMIASELLQLPVKNTTK-----XSATRKCSCFSPSRFQWE
AgaPB9	RKELTVHLTQFYPAETIDP-----LSMVETMIGFKTQ
AgaPB10	-----
AgaPBD1	ALELLRPQARRRLDSKTLPR-----LLRQRIGLFLGLISREEYET
AgaPBD2	REQLVDQLVPLPNPTVERGLS-----GGEKKYTHHLEVRTDGNGR
AgaPBD3	RLAVAREWVGASEPLEEP-----TKFLPLIRG
BmoPB1	RLQLAKQLLQSSRSAAPSR-----LAPAARPEPAACIRDMHLP
Pigibaku1	GKALVRPQIERRKHIPRTPASAA-----MVRRIQKENAGALSTQPTPEQSAEPEV
Pigibaku2	GKALATPLIERRKHVPRTEASAA-----VVKAIQS--AGAP-DQPEVPATTATSP
Pigibaku3	QALVGTSLTSAGKTKIKCGRPPSS-----PEAT--ATPPKRPSCSVP-LDMRRD
Pigibaku6	-----PQQHPSAI-----IGKVCLR-----STSSGH
Pigibaku7	RVEVARTFLAQQYSQEDDADFPEL-----SEGEDDSTQGKRRPVMVPHVSVRRAN
TruPGBD1	RASVAQALCMEGKDPMRQKRGRPS-----LDVDGQFEIKKRRGPAKAI PPQEVRS
TruPGBD2	REQLILSLAGIGSTPRRSAPQNHPLAVAAAPAAPSSSQVPTTPTAPASSHLPAYFVEH
TruPGBD3	PPGFNGKQFTQRHFRVRLAQQLIG-----DYQGARGMERAARKRHADSPVE
TruPGBD4	RKRLGNQLAKCGQKYLDPGE-----MARSRTSIGPTEELVKERH
TruPGBD5	GERLVRELLLELDDCSPTQ-----
HsaPGBD5	GERLVRELLGLEDasPTH-----
Mmupgbd5	GERLVRELLGLEDSsPAH-----
HsaPGBD1	RRFVAHFYLEHNAHLSD-----
Mmupgbd1p	QKCVACFRLGH DANLSD-----Z-----
HsaPGBD2	RRYIACVYLESNADTTs-----QGRRSRRLLETESR---FD
Mmupgbd2P	RRHVASGASGEQXQTSS-----QGRRSRRLLETESR---LD
HsaPGBD3	RRRVVCHYLETHGHPPE-----PGQKGRP-QKRNIDSRyD
HsaPGBD3P1	RWRVVCHYLQTHGHPPE-----PGQKGRPSQKHNIDSHyD
HsaPGBD3P2	-----
HsaPGBD3P3	GZ---CHYLETHGHPPE-----PGRK-----
HsaPGBD3P4	HRRVVCHYLKTHGHRLK-----PGR-KRPSQKHNTDSyYD
HsaPGBD4	RLALIERMLEKHHKPGQQLR-----GRPCSDDVTPLRLSGRHFP
DpuPokey5	-DMVRSQMAEIKTSNTQ-----
CinPBD1	IEACVSGLLVDYNPHITEKWRP-----PQPGTVLSRILPPQYVHKI
CinPB1	IEEIASSELLNGYTSARKRAGKQ-----QSP-LHFKRLIPFQHqHFL
CinPB2	VVDISDNLLYRNSCSTP-TRGRPS-----NKRKLENDTLPGKKPFTPTPNEILRFD
CinPB3	ILTLVSQLCQQDRLQPQIDDE-----NLAGPPPKSPRIDSTKRLK
CinPB4	ILKLVSQLCQQDRLQAEVDDD-----TVAGPPPKSPRINSSNRLK
CinPB5	IQECITGLLQEYTPG-VLSPRR-----KSK-DTISRIVPDQYYHKL
DmeCG9839	RVIIIKSLLREEVTNEPVTsIQKP-----ETYERSKNKPVEPRLKTIHHEPML
DmeCG13151	LGQSSQRLSSEATGEAKLTHSVG-----VLTDPKMSLPLGINLASRYGEK
DmLOOPER1m	YIPLALLHLKKETSKNKZRTRKLS-----SIIGIPKQCLFASIKEVQIFDK
NhaPB	-----
OsaPB	MIELASELITGKWNDTVENEGMVFADDQLSTTSRSTTGYPKAPSTVASPTPPCDVVLsLT

TniPB DDSTEEPVMKKRTYCTYCPSKIIRKANASCKKCKKVICREHNIDMCQSCF-----
 BdoPB EDSTEEPVTKKRTYCTYCPSKIIRKATASCKKCKKVICREHNIDICQSCF-----
 AgaPB1 RYKVQTSCHEGKSANECFTCNRPVCKKCTKRISYVCVSCEPGSDEAM-----
 AgaPB2 ERDVTG-RIQQKGKCHLCVKRRATRKECSLCKKPVCEHSSNKVVCKNYVSTTNT-----
 AgaPB3 IRDASG-RLKHKGNICYICKRRSTRKSCGKCEKPCASHSSNRIYCNQCK-----
 AgaPB4 -RDVSG-RIKHKGNICYLCKKRSTRKSCSTCKKPICTLHSLVIKTSCKPCD-----
 AgaPB5 KRASG-RVKHTGTRFLCVKKRSTRKVCZCKKPVCTQHSKIITKCDHC-----
 AgaPB6 TLRRMCVNCYIKMLQCSSRKDVHRNAKVHNNVLWQMAKYTSNVHELQFQVPLMLFEQLWC
 AgaPB7 DIVENFVDNYVVEETFVPAACMEENGSEKCYV-----
 AgaPB8 KMRRACKRCYNNDRQSMGRSKVRETVKRSFTNCPSPDQPOLCDECFKIVHOK-----
 AgaPB9 HYFERKPGVTHTVRRYCKQCYAENVARLGRTKSKIITKKVATYCRNCEG-----
 AgaPB10 -----
 AgaPBD1 VPVVERQGGESRGRCYLGRARNKTTRISCHSCGKYTCNAHCAQLCRTCYMDDCASEQQE
 AgaPBD2 TVRRSCANCYAESRKTMSHYEAGRNNKATTTFCGSCPKQPQLCMPCFNKLH-----
 AgaPBD3 RKRKFLPLIPGRKRKETGLHNRVPKHPARN-----
 BmoPB1 -----GKNTKKQRCKLCYSAKVQR-----STVWRCTLQCHLCIV-----
 Pigibaku1 NVZXVVNSSNKKRCEVCGPKMDRKTQYTCIKCKKYICNTHTVKLWPCV-----
 Pigibaku2 AR-----ASKRKRQFCQKQKDKPHTVCKCKKYICKSCALAYCPTCAN-----
 Pigibaku3 GIDHFPTWET-RQRCKHCTGNHFSHVYCEKCKVHLCLNKEINCF SAYHKVK-----
 Pigibaku6 RZ-----KEGKRCQVCPSSREDNKTSTSZLNFKNYICR-PTVTFCPSCGEQZ-----
 Pigibaku7 AHLPEMISLKNAARCRAAGCTGRTRVRCVTCKVFLCLQTELNCYAAFHTZ-----
 TruPGBD1 AVGHWPVVENGRQRCCLPNCKGQTVYKCAKCNVHLCLNKVNNCFCEFHK-----
 TruPGBD2 MNDVTPRFRATLGRRTCVLCKRKSPLYCSTCKKTLCTSLRNCYRDWHRNSICT-----
 TruPGBD3 YGHRLEMSERSRRRCNCTNKGLRHESVFGCKICNVHLCRGGCFSEFHK-----
 TruPGBD4 RLAKISTFSKRCKNCLKNLRHESVYGCSTCGVNLCKQPSCFWEFHGLPPLHKGCN-----
 TruPGBD5 -----
 HsaPGBD5 -----
 Mmupgbd5 -----
 HsaPGBD1 -----
 Mmupgbd1p -----
 HsaPGBD2 MIGHWIIHQDKRTRCALCHS--QTNRCEKCKQKGVHAK----CFREYHIR-----
 Mmupgbd2P MIGHWIVHQDKRIPCALCHS--QTNRCEKCKQKGVHAK----CFQEYHFP-----
 HsaPGBD3 GINHVIKQKQTRCAECHK--NTTFRCEKCDVALHVK----CSVEYHTE-----
 HsaPGBD3P1 GINHMIKQKQTRCAECHK--NTTFRCEKCNVALHLK----CSVEYHTE-----
 HsaPGBD3P2 -----
 HsaPGBD3P3 -----
 HsaPGBD3P4 GINHGIKQGMQMWYAECHK--NNTFQCEKCDVTLHVK----HSVEYHTGQ-----
 HsaPGBD4 KSI PATSGKQNPTRGRCKICCSQYDKGKKIRKETRYFCAECDVPLCVVPCFEIYHTKKNY
 DpuPokey5 -----
 CinPBD1 IKIDKKPQCVVCSDSRRKLGRRQTSFMCEKCNVALCVVPCFHRYHTLKNYRVCHLDM---
 CinPB1 GK--TTRKSCQCCN-----KQTMTLCKKCNVSLCALDCFERYHSLQEYRMK-----
 CinPB2 QISHWPEPRSQRGRCLCKS-GYSQIYCSKCHVCLCLKSSNNCFKEFHCKN-----
 CinPB3 -----GGFKKHVIALYPPTKKKAAAQRPCRAMKNGCRKDTILL-----
 CinPB4 -----GGFKKHVIVLYLPTKKKTAQRRCRVCMKNSCRKDARYYCAYY-----
 CinPB5 IKEESSKPNCAVFF-----LSVZANTRDYPNDLKCKQAIKRGKSREKDFWYICLEITIZ
 DmeCG9839 IQQNGKPAKKNCRYCHKGGMLQFSRYMCNTCPDKPGLCQEPFLLWHEQLKKVIRQTIGR
 DmeCG13151 HRRCKPCARNKRGTKSRTRCQCLQHRCGNHLSRCYECVGIPLPGQLPEGNMVDEGAT--
 DmLOOPER1m SYXEHWVVFGERGRCLCKT-ATPMTKCLTCKVHLCCNNKNCFFVI PHLNCHYKEKYFI
 NhaPB -----
 OsaPB RFPEATRGKRGCKVCMFEGRTWTMTLYCIRHNVCLCTKSYSLNQSLADVVCPTHDTWTSW

TniPB -----
 BdoPB -----
 AgaPB1 -----
 AgaPB2 -----
 AgaPB3 -----

AgaPB4	-----
AgaPB5	-----
AgaPB6	-----
AgaPB7	-----
AgaPB8	-----
AgaPB9	-----
AgaPB10	-----
AgaPBD1	-----
AgaPBD2	-----
AgaPBD3	-----
BmoPB1	-----
Pigibaku1	-----
Pigibaku2	-----
Pigibaku3	-----
Pigibaku6	-----
Pigibaku7	-----
TruPGBD1	-----
TruPGBD2	-----
TruPGBD3	-----
TruPGBD4	-----
TruPGBD5	-----
HsaPGBD5	-----
Mmupgbd5	-----
HsaPGBD1	-----
Mmupgbd1p	-----
HsaPGBD2	-----
Mmupgbd2P	-----
HsaPGBD3	-----
HsaPGBD3P1	-----
HsaPGBD3P2	-----
HsaPGBD3P3	-----
HsaPGBD3P4	-----
HsaPGBD4	-----
DpuPokey5	-----
CinPBD1	-----
CinPB1	-----
CinPB2	-----
CinPB3	-----
CinPB4	-----
CinPB5	-----
DmeCG9839	SE-----
DmeCG13151	-----
DmLOOPER1m	FCDL-----
NhaPB	-----
OsaPB	QKYNDYYLPNGIFDEHGR

Supplementary Data File 3. NEXUS/PAUP file of amino acid sequences of the 50 *piggyBac* –like sequences used for phylogenetic analyses.

```

#NEXUS
BEGIN DATA;
dimensions ntax=50 nchar=798;
format missing=?
symbols="ABCDEFGHIJKLMNPQRSTUVWXYZ"
interleave datatype=PROTEIN gap= -;

matrix
TniPB -----MGSSLDDEHILSALLQSDDEL
BdoPB -----
AgaPB1 -----MFISDKESTCQGPGRKH
AgaPB2 -----MTDIEWLELSPAELSLSDAD
AgaPB3 -----MADIEW--LTPEELSMMSESQ
AgaPB4 -----MEEIEW--LTPEELSNLTEEE
AgaPB5 -----MESNDW--LSIQQLDELSLEE
AgaPB6 -----MNTHTDFDTHMDL
AgaPB7 -----MDTNTTEIHPALS-
AgaPB8 -----MFEANMPKLI EAQSGDEEDIRI
AgaPB9 -----
AgaPB10 -----MLE
AgaPBD1 -----MGDAMHVQWLSEETEEVPE
AgaPBD2 -----MADNLNNI PN
AgaPBD3 -----MFPLPSNCDPVFTM
BmoPB1 -----
Pigibaku1 -----MAKRNSAQRALELILEDL
Pigibaku2 -----MSARYNAEEALELIFT--
Pigibaku3 -----MVVCLYVLALRLT--
Pigibaku6 -----MSG--YGPEALKMWDL-L
Pigibaku7 -----
TruPGBD1 -----MRATSVYATRVR--
TruPGBD2 -----MQHVKSLIISFIYREDTSYEDSSE
TruPGBD3 MATARKGRELVTILETSADAESSTACDGRESPLNLSADVWFIEIPYRKP
TruPGBD4 -----CVEPDI
TruPGBD5 -----
HsaPGBD5 -----MPDYRTRALFVQSTLGD SAGPELQLLSI
Mmupgbd5 -----
HsaPGBD1 -----ECAPQIPCSTPIATERTVAHLNLTLDKDRHP-G
Mmupgbd1p -----SPSPTEKAVSTLNTVGSCHPPH
HsaPGBD2 -----MASTRDVIAGRGIHSKVKSAKLLLEVLNAMEEEEEES-N
Mmupgbd2P -----AVPARRGAHWTVRSPKLLQVLTAL EEGEF-G
HsaPGBD3 -----MPRTL SLHEITD LLETDDS--
HsaPGBD3P1 -----MPQTL SLHEITD LLETDDI--
HsaPGBD3P2 -----MSQTL SLHEITX-LNTDDS--
HsaPGBD3P3 -----MPZTL SLHEITD LLETNDS--
HsaPGBD3P4 -----MLQTLNLHETIDLLKTDN---
HsaPGBD4 -----MSNPRKR SI PMRDSN
DpuPokey5 -----MQKKADAKKVAQHKAAN
CinPBD1 -----MAVKGVSADETIWSFLEAES-EKDK
CinPB1 -----MFTVRTFSVEEAAAICCDVDS CDENM
CinPB2 -----MMQLQLILSGDVS--
CinPB3 -----MFSAT
CinPB4 -----LFFAT
CinPB5 -----
DmeCG9839 -----MSSSGRKRKQQLKPRQ
DmeCG13151 -----MECVLDEELLANIKCSDQEE
DmLOOPER1m -----MEDI STVLEKNL
NhaPB -----MRGTKSLIPEGIPANSP

```

OsaPB -----

TniPB VGEDSDSEISDHVSEDDVQSDTEEAFIDEVHEVQPTSSGSEILDEQNVIE

BdoPB -----

AgaPB1 TYVADIGTGPSKETCRASSTRQATDSNAGRTPRVVPAKSKKDQVDIQSKE

AgaPB2 KLNRYRQKILDELTEQ-----VVGYLEEDD--IASIAN-FDSDVEDIE

AgaPB3 KSAY-ERKMCDFLRN-SEDCEVESIYNDEEDQSIFVLDN-ICSDAEIIEQ

AgaPB4 RTAYTQQKIHEFMEYGESEDENMISAVVEEDE--IPVFDQVIIDSDAEEVQ

AgaPB5 RERYNQRLQEMAEEGSDEEVLLFPSTGEDQNDCLVSGA-LNDSDAEELQ

AgaPB6 ETLTDLDTHTDIYSDDTDTDTNVSYSQDLDEILKEL-----

AgaPB7 -----SNMETDSNTDMDEVSYSNELEELKEI-----

AgaPB8 PKNTRNRIVSSDSESDNYDGSDCDCDESSLPDVFREM-----

AgaPB9 -----

AgaPB10 EQEDTDFSSFGFVPRRQRRVLRFFYQLKMKKLVSEK-----

AgaPBD1 NEEDMLYEDVEYIEEYVHFDPGPESNVSGSVAVQNEESTG-----

AgaPBD2 CFPNNEDSSSDSDHDAKSDSDMENNIEEVMQASIMEE-----

AgaPBD3 AALGPYVVIIEPLDSEYVVNDTGPAAACAEATPNTDGGGEP-----

BmoPB1 -----

Pigibaku1 EVFDDDDVEGEDSEEEVSEFEDHISENSESDS----DSEEDDEIEHQVPVK

Pigibaku2 HVQQDSSDSEEEVEDLSEEEEDGEYYNPEHDE----SSSEE---EENPEAE

Pigibaku3 -GVQSRVYPASAHCAGIGSS-----PPATLSGG-----TSG-

Pigibaku6 CISQPLMELZKKPIMLEVNLRFSFCVIQRT----SYSFFFFMKFGDFFS

Pigibaku7 -----

TruPGBD1 -GPRARNVPLSDSDSCLSDSGDSDEEYTPGPGDEPSGS-----SSDE

TruPGBD2 EEWNSSATKRGAVGKHRCSDSVSPLSMSLRSPSKRKEERCMPGPPRKR

TruPGBD3 SDEEEEVREEEEDDGGVGGGEGENGFAAAAAEPADAASFIAGGGCNIIL

TruPGBD4 PFCDAEVQSADQRDLLTQNSDLPSSTWKSAN-----

TruPGBD5 -----

HsaPGBD5 VPGRDLQPSDSFTASSPPPSVWSELEHIRGKSEATTELKRPSLPGSIHS

Mmupgbd5 -----

HsaPGBD1 DLWARMHISSLEAYAAGDITRKGK-KKDKARVSELLQG-----LSFSG

Mmupgbd1p DSWAKMHIASLQY----ITQKGR-EKAKFRVIELLQG-----HAFSD

HsaPGBD2 NNREEIFIAPPDNAAGEFTDEDSGDEDS-QRGAHLPGSVLHAS-VLCEDS

Mmupgbd2P SNREEISLAPPDNASGDFADEGSGGEDSEQNGAZLPGWVLRALVVLCLGT

HsaPGBD3 IEASAIVIQPPENATAPVSDEESGDEEGGTINN-LPGSLLHTAAYLIQDG

HsaPGBD3P1 IEASARVIQPPENATTPVSDSEDEEGVIINN-LPGSLLFATAZLIQDG

HsaPGBD3P2 IEASTILIQPPENATAPVSDEDSGDEEGGTIKN-LPGSLLRATANLIKXD

HsaPGBD3P3 IDSSAVVIQQPETAAAPVSVSDSGDEEGGIINN-LPGSLLHTVAYLIQDG

HsaPGBD3P4 --SSAIVTQSPENATAPVSDEDSGDKKEGGTRNN-PPGSLLPATAYLIQDG

HsaPGBD4 TGLEQLLAEDSFDESDFSEIDSDNFSDSALEADKIRP-----

DpuPokey5 RNWKECKVWGDVGRQSRADDDSPRPQFQERAIQFAPLE-----

CinPBD1 GDAAYACSSDESILMDEFNATS-----SKNVDPNHCCLLSS

CinPB1 SLSESTYDSCESDDFIEPILTASPSTSANIQPVSVQDQEVSSDSDVSSA

CinPB2 -DVEDIGSSSEDETNDNTVQESFQDTVMNISVDPKVESE-----HKKK

CinPB3 AAAEILMDAGSDDLSDLESDDHEDDDVGSFIVPNVADIS-----

CinPB4 AATEILLDAGSDDL RDZESDDHEDDDVASFIALNVAYSS-----

CinPB5 -----

DmeCG9839 DDHRSPVKRRSVDIKSEPLDGYPALADYDLSTADIKPDLTELQLQLVAEQ

DmeCG13151 EDEDGEKMEVEERLPPVDSTVQSASFNGDDSDPLQEAVCNFPWIFEDSDM

DmLOOPER1m EGILERGESIEIDLLENTVIEGCEPDSCVVDV-----

NhaPB PKHHQFILIPSMTSPPILEEIQVINPYDDNSFIKEEHS-----

OsaPB -----

TniPB QPGSSLASNR-----ILTLPQRTIRGKNKH-----

BdoPB -----

AgaPB1 AAKTNRTLEGSLG-----KLAVGSVVEAPDGT-----

AgaPB2 IPQYDYDETD-DEDFDEEYELNAPESYTARDGT-----

AgaPB3 LPEYNASDSDNDDDFEEAID--PSNS-YKARDDT-----
 AgaPB4 LPEYNPLETDSDDDYAESFQ--LSSATYKTHDGT-----
 AgaPB5 VPEYNHIQXDSGDEYSEEWLDEYTAEEYKZKNGT-----
 AgaPB6 -----ADEEEKEESNI-----
 AgaPB7 -----AEEEDMEEEDV-----
 AgaPB8 -----ELEEERNHEGL-----
 AgaPB9 -----ZSCALSWKLV-----
 AgaPB10 -----NIQQFKKNGS-----
 AgaPBD1 -----HVIKIESIDHAF-----
 AgaPBD2 -----LDEDSQEQTG-----
 AgaPBD3 -----
 BmoPB1 -----
 Pigibaku1 QRRATGPGRQQPSGPEQASQHGGEIWMKNSI-----
 Pigibaku2 R-----ETFLSKNGKI-----
 Pigibaku3 -----RKZVRESV-----
 Pigibaku6 SG-----VMNWRAESGHV-----
 Pigibaku7 -----MRW-----
 TruPGBD1 DADVPPYAPPSAAGARREAATTQRNRQKVAWETV-----
 TruPGBD2 ISNASTLPKVSSSLQAVGVFSSGKQAEKELARN-----
 TruPGBD3 VTGSNGITHDEEEYAEDCYYSTSTNCSDATSNDSIDFSDLEEEERRSFF
 TruPGBD4 -----SWKHPGDAN-----
 TruPGBD5 -----
 HsaPGBD5 CLCGVWCGVGKRTPSSSLVSSLQDLELLGQRQRQL-----
 Mmupgbd5 -----
 HsaPGBD1 DSDVEKDNEPEIQ-----PAQKKLVKSCFPEKSW-----
 Mmupgbd1p ESETEEDNEPEVQ-----PERKKIKASSIPEKSW-----
 HsaPGBD2 GT-GEDNDDLELQ-----PAKKRQKAVVKPQRIW-----
 Mmupgbd2P QTXEEDPELQ-----PAKKKQQAAGKPQRLW-----
 HsaPGBD3 SDAESDSDDPYAPKDDSPDEVPTFTVQPPPS-----
 HsaPGBD3P1 SDAESDSDDPYAHNDDSPGEVPSTSTVQPPPS-----
 HsaPGBD3P2 SDAESDSDDPYALKFDSPEDEPSTSTAQQLPPS-----
 HsaPGBD3P3 SDAESDSDDPYAPKDDSPDEVPPTSTVQPPPS-----
 HsaPGBD3P4 SDAGSDZDDPSYAPKDDSPDEFSSTSTAQQLPPS-----
 HsaPGBD4 -----LSHLESDGKSS-----
 DpuPokey5 -----EPGPVLSQFN-----
 CinPBD1 DDETTVHTSSKLQKLLNDRSRSKRTVQOTHLEEL-----
 CinPB1 CAQPVHPKRAKMTKVKTNRKRPKVTNTSNIPHDL-----
 CinPB2 HVYR-----WRKRNI PVT-----
 CinPB3 -----DSDSESSDDSL-----
 CinPB4 -----NSDDSSDNSL-----
 CinPB5 -----
 DmeCG9839 QAASNTIRLELEQQESDSEDEGYSELDYQAEDVFC-----
 DmeCG13151 LMNEDQLADVVLKKEDESARPAAPKRGRGRPPNNG-----
 DmLOOPER1m -----CLEKIDPKTL-----
 NhaPB -----HCLWQDDPTQAVN-----
 OsaPB -----MQEPP-----

 TniPB -----CWSTSKSTRRSRVSALNIVRSQGPTRMCRNIYDP-----LLCFKL
 BdoPB -----STRRSRVSALNIVRSQGPTRMCRNIYDP-----LLCFKL
 AgaPB1 -----QWKVVEVNNANGGIVAEVNVIRDVPGPSAYAKRYVVAGAVSSSWRL
 AgaPB2 -----IWTTQ-PPPLRKILMHNVIKDNLASHLKNKSDKDK---SAVDIFKL
 AgaPB3 -----FWHSQ-PTVPRKILSHNLR--PSSGPTKTKSL---SIMNTFKL
 AgaPB4 -----IWSSQ-PTIPRKILAHNLR--SQSGPTLKTEGL---SIIKTFKL
 AgaPB5 -----VWSSEHPGNTHKILAHNLRZ--KNTGPX-KTKVL---SIVHTFKQ
 AgaPB6 -----ELP-SSLETINFTEFLGGQKTFQFTGKGLKTSHYKNITPGESLSL
 AgaPB7 -----ELA-PSLDAIQWSEFSGRQKSFQFTGKEGIQIEHSGKITAEESLSL
 AgaPB8 -----PQQKSTIQSTAWSEFTGRQKSFQFVEENQLSLPP-LDMTPYNVFLQ

AgaPB9 -----TRPASPGKRPSGFVASSSDLTIP-----ASYDR
 AgaPB10 -----NRNETMXSFTHFASTFGAKTNI EKVRN-----CRTVQDFYSL
 AgaPBD1 -----DMLQNSVWSIKPPERTGTMRKVAHPRPAPVGLAKSAKSPAECLESL
 AgaPBD2 -----RCVNALEARSSWKWPAGKQKPFPFRRKRLRVLDLPAKSTPYEIFSL
 AgaPBD3 -----EQQSDDDDLICLWEEPQTFGIFDEPVGTVNVPFDGADERTASEYAAL
 BmoPB1 -----
 Pigibaku1 -----EWSSRPRKGPPhKAAN-VIRMQPGPD-MAVTHTR-----DIKS-FEL
 Pigibaku2 -----TWSSAEYDQHGRRAEQNVIKMTPGPTRYAVSHAR-----DIVSSFYL
 Pigibaku3 -----EEG-----TEDRCDW-----TQYMYFKQ
 Pigibaku6 -----GVSLNVCTEFRYVDLRTVISTLPHQSRSNVIKMTPGPKRFASAFQL
 Pigibaku7 -----RATLLIPNLAEFENEDETEHRNG-----WTPLNYFEQ
 TruPGBD1 -----KQENSAKEVPVWQDALPDAAEAIR-----LPIQYFRD
 TruPGBD2 -----EPDADRWHDMDEEDFEPQPRFRPERVPGPQLNRTANYTPLELFLQL
 TruPGBD3 CFGDDLDLDDCASPDFWGEQDQVISIEPFSAVCGPQHSLGDDADTRDYFRI
 TruPGBD4 -----TKDHRIIPFVESCGRHFLPKNS-----DAIDFFNL
 TruPGBD5 -----MPDTATALDFFQL
 HsaPGBD5 -----WMESTPRPPYNPFLVPCTPVGKLSAEHGGPTRKMPPSASAVDFFQL
 Mmupgbd5 -----MPPSASAVDFFQL
 HsaPGBD1 -----TKRDIKPNFPSWSALDSGLLNLK-----SEKLNPFVLFEL
 Mmupgbd1p -----TKRDSKPNFPSWSALDSGLLNLK-----SEKLNPFVLFEL
 HsaPGBD2 -----TKRDIRPDFGSWTASDPHIEDLK-----SQELSPVGLFEL
 Mmupgbd2P -----TKRDTHPDFGXWEVSDPHIEDLK-----TKELSLVGLSEL
 HsaPGBD3 -----RRRKMTKILCKWKKADLTVQPVAGRVTAPPNDFFFTVMRTPTEILEL
 HsaPGBD3P1 -----RRRKVTKVVFQWQADLTXHPLAGRVTPEPKGFFSKMRTPTELLEL
 HsaPGBD3P2 -----RRRKVTKIVCKWXRDLTAQLVAGRITEPPNDLFTMRTPTTEILEL
 HsaPGBD3P3 -----RRRKVTKIVCKWXXADLTAQLIAARVTEPPNDFFFTMXTPTTEILER
 HsaPGBD3P4 -----KRRKVTKIVCKGIKAGLTVQPIRGRVTESPNDFFTKMRTPIEILEL
 HsaPGBD4 -----TSSDSGRSMKWSARAMIPRQRYDFTGTGPRKVDVSDITDPLQYFEL
 DpuPokey5 -----RFSNPLGVFKSMLGGEDTLYLLR-----EATNDYIAE
 CinPBD1 -----SAEDSMEDWVRIVTDYYPEDHNLRET---VMESGMDGVTPLDYLAM
 CinPB1 -----QFNWEPVNNSFETSFIPOSSSFSETSGYGGDLVLADSTPLDLLGL
 CinPB2 -----DSN-----FQLQKDNIDSIH-----SPITYFMQ
 CinPB3 -----PPPPPPANVWKSSITQQLNSFLGQHGPSSHACVSNDDSPLEYFRL
 CinPB4 -----PPQ--PANVWKSTITQQLNSFLGQQGSSHACVSNKDSSEYECFRL
 CinPB5 -----AHTLDNKTPTPS---
 DmeCG9839 -----QDDMDDYDPDWSSQQTGSRLLFKFP IQQSGLKFGQRFQGPQHYFNQ
 DmeCG13151 ---NYTSPCGQLWSVTRSPDISAEDLPLLGGQACGKGPARTVSNAVEAWML
 DmLOOPER1m -----KWRTRPFVAPESIWEDDKTFDVG-----DIKTTVEFFYT
 NhaPB -----LPAENDRGTNFKPFHVEIRKFRISPLPPTPLQLFLPLISLVEK
 OsaPB -----DLFVHSDGSTETKLIKEKRKHF-----SASSSFFA

TniPB FFTD--EIISEIVKWTNAEISLKRRESMTG-----ATFRDTNEDEIY
 BdoPB FFTD--EIISEIVKWTNAEISLKRRESMTG-----ATFRDTNEDEIH
 AgaPB1 IIDN--GILNQIRKCTEIEARRVLQT-----KNWTLSAFELE
 AgaPB2 FFST--PICEIVIRETNRKADQFCANYNASHP---DSNIQWQPLTPSELD
 AgaPB3 LITP--EICDIIIRETNRKAKQTLEKLOTENP--TAQSRSWNPLTTNEFD
 AgaPB4 LMSD--EMIDIIVRDTNRKAQQIYEREQVTNSGKSASMHTWTKLTKEFE
 AgaPB5 LVTE--EMCDLIFRETNRKAILCFQNSNESDR---VHSDWKPLTSSEFD
 AgaPB6 FIND--SVLKLIAETETNNYAHKKYANGTKN---KHARGNYWTPTEHEVK
 AgaPB7 FINN--DILKLIANETNKYAEAKYTR--IIE---KHARGNSWTPTEGEIK
 AgaPB8 FVDQ--EIIEMIVTQTNKYALQKLDNATLS---QGARMKWKPTNSAEMK
 AgaPB9 FVSD--HLFEKIATQTNLHAVAQSRCP-----NPSPEAWVATDQOEIK
 AgaPB10 LVTH--ZIFEYISEQTNIIYAAQSNSS-----NRSKKWYPTNKDEIK
 AgaPBD1 FLDA--DVIAMITEYTNEQIKAEQPN-----YARERDANPTDEMEIM
 AgaPBD2 ILDD--KLVAHIALAMNLYMEKKNAQ-----KSKASKWLETNPKEVR
 AgaPBD3 VCDD--ALFDILVKGTRNRHRKQWADCMRAG---GQSVEPYRKVTVAEMK
 BmoPB1 ---A--DIIAYIVRETNRGAQLIRSTIPSK--PNSRLSRWKDVTSDIY

Pigibaku1 FIPD--SIQEIIILDCTNLEGRRVFGE-----RWKELDQDTQLH
Pigibaku2 FITP--AIEKIILEMTNLQGRKYGD-----SWKKMDETDLQ
Pigibaku3 FVTD--EMLQETAEQTNLYSVQ-----N-ECKSVNTTAKEIE
Pigibaku6 FIFP---IERIILEMTNMEXRPVFQE-----KGKPVNQTDLH
Pigibaku7 FIDR--DLMKTIADCTNAVSLs-----RSGDLLKTSVDEVY
TruPGBD1 FFDG--ELLDKIVEQSNLYCTQ-----QHPNRALNLDLDRPELE
TruPGBD2 FFST--TVIDNLVKHTNANGKKRQ-----AQQKHWHVTVREDMY
TruPGBD3 LFDP--SLFEHMVEQTNKYALYRQRS-----GKSDPHWHPTDVREMK
TruPGBD4 LFPE--TLIELISKETNDHAKICQFLWS-----SFPDWVPVTNSEIR
TruPGBD5 FVPD--NCIQNMVVQTNMYAKKFQER-----YGSDESWHPVTAEEEMK
HsaPGBD5 FVPD--NVLKNNMVVQTNMYAKKFQER-----FGSDGAWVEVTLTEMK
Mmupgbd5 FVPD--NVLKNNMVVQTNMYARKFQER-----FGSDGAWVEVTLAEMK
HsaPGBD1 FFDD--ETFNLIVNETNNYASQ-----K--NVSLEVTVQEMR
Mmupgbd1p FFDG--ETFNLIVNETNNYASQ-----K--NVSLEVTVQEMR
HsaPGBD2 FFDE--GTINFIVNETNRYAWQ-----K--NVNLSLTAQELK
Mmupgbd2P FFGD--GTTSYIVHETNRYAX-----TLNLMTQELK
HsaPGBD3 FLDD--EVIELIVKYSNLYACS-----K--GVHLGLTSSEFK
HsaPGBD3P1 FLDE--KFFEFIVKFSNLYAGS-----K--GVHLGLTSSKFK
HsaPGBD3P2 FHDD--EVVELIVKYSNLQARX-----K--GVHLGLTSSEFK
HsaPGBD3P3 FLDD--KVVELIVRYSNLHARS-----K--GVQRGLTSSEFK
HsaPGBD3P4 FHDD--EVVEFIVKGSNLCARS-----K--DVHLGLTTSKFK
HsaPGBD4 FFTE--ELVSKITRETNAQAALLASKPPGPK--GFSRMDKWKDTDNDELK
DpuPokey5 FWSS--RKTPPSRKVGGKPEGRLIG-----PRLPAGGFVTDHELIV
CinPBD1 FLFA--EFWDLVLTETNRHAAQTLRKK--KLK-KGSNLRTWKDTTVAEMK
CinPB1 FLTN--EFWQLLVDFIKSKLTSYLQKQTDLEP-KFSKFRKWSPVTHADIK
CinPB2 FFPE--SLIRTIVEQTNLYSTQ-----K-IGVSINTNYSEIC
CinPB3 IFTD--ELLTLVVEETNRYAAQYLQKTSLS---SKSRAHKWKPVDAEELS
CinPB4 IFTD--ELLTLVVEVIIRYASQFIZKTSLT---PKFRANKWKPVDAKGMC
CinPB5 -----SRLQRWKDTNIPEMK
DmeCG9839 VLGNRSKFFSSLAQSCNLKGGE-----LKSNPTTAAEEME
DmeCG13151 LFDD--EMLRSLLRHINEQMRKRR-----TATSVQRPLDVVELR
DmLOOPER1m LFDT--QLIHLMARQTDIYSLQEHG-----IELKCTDEEIK
NhaPB WVSYTNSWITCLKENGVVDSWNNPMG-----KTSYLHKWEGTTVSEVL
OsaPB YLPL--SFWKAVLGETNKYAAAS-----PAKGKTVTLEELM

TniPB AFFGILVMTAVRK---DNHMSTDDLFDRLS-----SMVYVSVMSRDRFD
BdoPB ALFGILVMTAVRK---DNHMSTDDLFDRLS-----SMVYVSVMSRDRFD
AgaPB1 AFLAILYIRGATE---SKGMEIDLWSEKYG-----LPFCCKNVMSRNRFR
AgaPB2 AYIGILIEAGVTH---SNDLALAEELWKTNS-----HPLFRASMGLKRFI
AgaPB3 AYLGILLEAGVTC---SNHVHAADLWKTNS-----HPLFRASMSLNWFW
AgaPB4 AYLGILLLAGVMR---SNYVHSTELWKTSS-----HPIFRATMSLQRF
AgaPB5 AYIGLLLLLAGVX-----YMPVTELWKTSS-----HPMFRASMSIQRFW
AgaPB6 KIIGILIWLG-FF---QF-PLEKYWSESP----IFNFSFLKKLISRQRFQ
AgaPB7 KLLGILIWMG-FH---QL-PMKKCWSTNE---MYNFSFLRNIMCRIRFE
AgaPB8 KFLSLLLWMG-LV---KVNPPVVNYWSKNT---LYNFKLPSTVMSRNRFE
AgaPB9 RFFGLTWYDC-----XPPLRLYWSDDP---AYVQTFPKSAMSGERYA
AgaPB10 KLFGLPIWMG-LV---KLPEIRLYWSTKP---IYAQSFPRKIMSRDRFE
AgaPBD1 ALLGVLYIAGTVR---DGRENIERLFDTKMG---TGLEAVYLTMTSLRYH
AgaPBD2 KFIGLMIWMD-LV---RVGRLEDYWSESA---LYNFVAVPRAAMYRERFR
AgaPBD3 RYVGLLLVMG-QV---RKDCQHCYWSTNP---LLETVPVFANTMSYKRFQ
BmoPB1 GFXVLMQLSL-VI---DYVEREYWYAVIE---ELQIGNFKEIMTYNRFI
Pigibaku1 AYFGVLILAGVFR---SKGESAEWLDAETG-----REIFRATMSLENFH
Pigibaku2 AYLGLLILAGVYR---SRGKAAASLWDAESG-----RPIFRATMPLKHFH
Pigibaku3 QVLGMYMHMG-LV---QMPVCVAYWEMET-----KLPVAVCDVMSQDQFL
Pigibaku6 GYIGMMLLAGGYM---SKGEATTRLWKEENG-----RPIFHAKMX-ETFH
Pigibaku7 HFFGACILMS-CV---PYPKMRMYWSKSLR-----FTSITDRFTRDRFF
TruPGBD1 QFLGTVVYMS-IF---LLPWSRMYWSSTS-----RVQQAQVAEVMSRDRWE

TruPGBD2 SFLSLVLYMG-MV---PLKAMTDFWKGSK----LYRLPFPSSVMPSNRFL
 TruPGBD3 AYVGLNILMG-IN---QLPDTGMYWASDIFIG----NAGFKKMTTARRFE
 TruPGBD4 GFIGLIILMG-IK---NLPDLSQYWSWTHN----DNSYTFYQTMSLIRFR
 TruPGBD5 AFLGFVTSTS-IH---RCESVLSIWSSGF----FSNRS-IALKMSQSRFE
 HsaPGBD5 AFLGYMISTS-IS---HCESVLSIWSSGF----YSNRS-LALVMSQARFE
 Mmupgbd5 AFLGYVISTS-VS---HCESVLSIWSSGF----YSNRS-LALVMSQARFE
 HsaPGBD1 CVFGVLLLSG-FM---RHPRREMYWEVS----DTDQNLV-RDAIRRDRFE
 Mmupgbd1p CVFGVLLCSG-FV---RHPRMGMYWEIS----DSDQTLV-RNEIRRDRFE
 HsaPGBD2 CVLGILILSG-YI---SYPRRRMFWETSP---DSHHHLV-ADAI RRDRFE
 Mmupgbd2P CVLGILILSQ-YI---SYPRRLVFWETAP---DSHHRLV-ADAI RRDRFE
 HsaPGBD3 CFLGIIFLSG-YV---SVPRRRMFWEQR---TDVHNVLV-SAAMRRDRFE
 HsaPGBD3P1 CFLGIIFLSA-YV---SAPRRRMFCKQR---TDAHNILV-SAAMRCDRFE
 HsaPGBD3P2 YFLGIIFLSG-YI---SVPRSRMFWEQXNKPDHNVLV-IAAMRRDRFE
 HsaPGBD3P3 CFLGIIIXLND-YI---SVHRRHTFWEKR---TDAHNILV-CAAMRCDHFE
 HsaPGBD3P4 SFLEIIFLSG-YI---SVPRRHMFGQX---TDAHNVLAZCTAMRRDCF
 HsaPGBD4 VFFAVMLLQG-IV---QKPELEMFWSTRP----LLDTPYLRQIMTGERFL
 DpuPokey5 AFFGIQFLIG-YH---RLPELSMFWEQPD--AGLGLGIIQQAMTRERFK
 CinPBD1 AYFAILLSMG-LC---NTVDMQDYWSASW----ITVTSSISKIMSRVRF
 CinPB1 AYFAMNLLMG-LC---SKHSIKDYWSMYS----YTNTAGISSLMRDRFQ
 CinPB2 MFIAIQIKMS-IL---HLPSYLMYWSKEM-----RFPPIADSI SLKRYQ
 CinPB3 LFLGLTLLTGVVH---KRGKLESYWIKN-----MIETPYFGKCMSRNR
 CinPB4 LFLRLTLVT--SI---KRRNLGSKWSKDS----MIEX-YFGKISXIZYQ
 CinPB5 AYFVLLLTMG-LC---HKPDINDYWSAFS----VTLTSGYGKIMSRNRFL
 DmeCG9839 IFMALSLLMC-DL---KLEHLSDYWSTNMFYG----LVGFSGKIPLERYQ
 DmeCG13151 AFLGLSYLCGVFRNARHNGPLDELWTLELG-----NAIFRASMSLARFE
 DmLOOPER1m RYIGILLYFG-VL---KLPQFRMAWSKDLK-----ITAITDSMPRGRFK
 NhaPB TMIGVLIYMDVHK---EKTIRSYWNPPKPG-VQRPAAHSFIKFISYNKQF
 OsaPB RFFGIMFYMT-IV---DKGEYSNYWGEQVED----EIFGVTSTLGLEKLM

TniPB FLIRCLRMDKKSIRPTLR--E-----NDVFTPVRKIWDLFIHQCIQNY
 BdoPB FLIRCLRMDKKSIRPTLR--G-----NDVFTPVRKIWDLFIHQCIHNY
 AgaPB1 EIMKFLRFDEKSTRSQRLQ-----TDKFALISDVFSRFVSNQQTNY
 AgaPB2 SITRFIRFDNGSTREQRK--K-----TDKAAAI SQIFGILNTNLNSCY
 AgaPB3 VINRFIRFDDSRTRTERK--K-----EDKATAISGVFGMLLKNLQSCY
 AgaPB4 SINRFIRFDDRRRTREVRK--K-----MDKSAAISDI FAMLNRNLQACY
 AgaPB5 SISRFIRFDNGQTRQQRK--T-----MDKAAAI SDVFQMLYANLKSCY
 AgaPB6 LIMSNFHLSDNERIESPTRL-----DKISPLVQLLINNYQAVY
 AgaPB7 LLLSNFHLADN-STDSQNRL-----YKIAPLIEMLLQNYQTIY
 AgaPB8 ILLSNLHFTDNTSISPKNRQ-----GKIINLMDKLQEKYQKVY
 AgaPB9 HLLHMIVFCNXSSQEQLN-----RPFLSKI QPLVDTLQANFKKHF
 AgaPB10 ILLKMLHFSNNELEVKSD-----RLSKVSYIIKALNQNFQKYY
 AgaPBD1 FLIRSIRFDDPTAAPDEIE-----GDKLAPIRPIYERIVSNCQKYL
 AgaPBD2 ALLGAFCFYDDGTSKTDYKEP-----GKIGAFIDVLQSKFQALL
 AgaPBD3 QISHYFHGMKQANR-----TYDAKPVLDHLV PKFQALY
 BmoPB1 VIKRCLHFIDNATL PVPPT-----KLDKI IPI IEHLNKKFKSLY
 Pigibaku1 IISRIIRFDNZDDRPARW--Q-----RDKLGVI RTVWDKVVRRLLPLY
 Pigibaku2 TYSKLLRFDDRESRPARR--V-----TDKLAAIRDVWDKVVWVWLPYLY
 Pigibaku3 KLLTKIHFKDNLVSDDAK-----KDKLWKL RPWLQKLRDQFLCIR
 Pigibaku6 MILRVIRFNNHDTRLGDV--K-----KT-----NYKQRYVVGZMGZNY
 Pigibaku7 KLRQSLKVLIDDDVPEDLR-K-----SDKFWKVRPFLDRILQCCRSQT
 TruPGBD1 EIKHFIHFCDNSAPNND-----DRLFKIRLVIDSLLPKFQALP
 TruPGBD2 AISRSLHINDPAVETANDLKKGTPG---YDKLCRIKPLYEQILAACYTFF
 TruPGBD3 KLTQYLQLCDREFEPGRGERG-----YDGLFKVRPLLDVVENTMWDAY
 TruPGBD4 QIAANIRMGSVTTAECRGAQS-----SDALSIFRPMLEILGGAMWSTY
 TruPGBD5 KILKYFHIVAFAFR----PSQGS-----NOGLYKI QPFLDSLQQSFSHTF
 HsaPGBD5 KILKYFHVVAFAFR----SSQ-T-----THGLYKVQPFLDSLQNSFDSA
 Mmupgbd5 KILKYFHVVAFAFR----SSQ-T-----THGLYKVQPFLDSLQSGFDDAA

HsaPGBD1 LIFSNIHFADNGHL-DQ-----KDKFTKLRPLIKQMNKNFLLYA
Mmupgbd1p LIFSCLHFADNKHL-DQ-----KDKFSNLRPLIKQM-KNFPLVC
HsaPGBD2 LIFSYLHFADNNEL-DA-----SDRFAKVRPLIIRMNCNFQKHA
Mmupgbd2P LIFSYLFCFMGNSGLYDE-----SDRFAKFRPLIVRMNCHFQKHA
HsaPGBD3 TIFSNIHFADNANL-DP-----VDKFSKLRPLISKLNERCCKMFV
HsaPGBD3P1 TIFSNIHFADNANL-DP-----MDKFSKLRPLISKLNERCCKMFV
HsaPGBD3P2 TKFSNIHFADNANL-DP-----MDKFSKLRPLISKLNERCCKMFV
HsaPGBD3P3 TIFSNIHFADNANL-DP-----MDEFKLRPLISKLNERCCKMX--
HsaPGBD3P4 XTFSNIHFADNANL-DP-----MDQFSEWZPLASKLNERCCKMFA
HsaPGBD4 LLFRCLHFVNSSISAGQSKA-----QISLQKIKPVDFLVNKFSTVY
DpuPokey5 FISKHLIACASPWDDVDPNSDDPDQEPERPDPIRKIRPLVKRLNERYHACR
CinPB1 SIRAFHLHFNNENYIPRGQPG-----HDRIFKIRNIVELVTKNFSKHY
CinPB2 KLRRFLHFVDNSTFNSD-N-----PNKLFKIQPVLDAVRNECIKIQ
CinPB3 AITGFLHFNDNEKLAENIDND-----KLYKVRPVYDLIVARWKALY
CinPB4 VITGFLHFNDNKKLPENIDND-----KLYKILSVYYLIVARWKSLY
CinPB5 LIRSMLHFCNNEDFIPRHEEN-----YDRLFIRRLVDIIVPKFDQVY
DmeCG9839 QLLHCLNFDAPQLQAGRAK-----VKNSLLLDFFINERMEEIY
DmeCG13151 SISECLAGNCGWSEGQK-----LWQRLIINCRSYY
DmLOOPER1m KIKQCLHFNDNAKQLKKGDCN-----YDKLYKIRPLLRILKXILEKLT
NhaPB LIHRRLRPFDHHTKYDETAPIP-----KVFQCVVEEWSDHIIQAVSMQIF
OsaPB TLKRFYIRKNLCFRYDISKADLK-----KDPAARIRPLINMIKHTSLKYV

TniPB TPG--AHLTIDEQLLGFR-----GRCPFRMYIPNKPSKYGIKILMMCD
BdoPB TPG--AHLTIDEQLLGFR-----GRCPFRMYIPNKPSKYGIKILMMCD
AgaPB1 VPG--PHISVDEQLFPSK-----TRCPFTQFMASKPKDKYQKYWMAVD
AgaPB2 KPR--NNLTIDEQLFPYR-----GGTGFTQYIPSKPAKYGIKIWWICD
AgaPB3 IAG--MNVTVDEQLFPYR-----GGTGFTQYIPSKPAKYGIKLWWACD
AgaPB4 VAG--SHVTVDEQLFPYR-----GGTGFTQYIPSKPAKYGIKMWWVCD
AgaPB5 VPG--MNVTVDEQLFAFR-----GGTGFTQYMPSPKPAKYAIKVZVWCT
AgaPB6 TPG--KDIVIDESMVPFK-----GCLIFKQYIPTKAHKYK-IKLFKLC
AgaPB7 TPG--KDIVIDETMVPFK-----GRLIFKQYIPSKAHKYK-IKLFKLC
AgaPB8 TPG--ENIVIDETLIPWR-----GRLIFRQYIPSKAHKYK-IKMFKLC
AgaPB9 VPTEEEEDIAVDESLLPGX-----RGRTAFRQKQPQYAAQQGGNKVFKLCC
AgaPB10 DPP--ETVSIVESLIPFR-----GRIVFRQYLKNKRHKYGTKIFKLCF
AgaPBD1 RPG--RFLMLDEQAVQFK-----GKCEFRQILPSAPGRAGFRFHLLVD
AgaPBD2 HLG--EDVVVREMLALGR-----DRTSFKQYIPASAHRHGRWALFKLC
AgaPBD3 APK--QQLIVSELTIPQDVLNGQQTPEPNHSEDAQGSTPESAKRLRLLCE
BmoPB1 VLE--QNIAIDESLLLWK-----GRLSFAQKIATKRPRVG-IKSYELC
Pigibaku1 NPG--PNVTIDEQLMPFR-----GRCPFLQYLPSKPAKNGIKIWAACD
Pigibaku2 N----TMVPRGNLFTYFXCLL-SKGRCPFRQYMPSKPAKYGIQSWVACD
Pigibaku3 PEE--CHAVDEIMVPFKG-----K-SHLRVYMPAKPHKWSFKMWGRAG
Pigibaku6 LVV--QACSP-----YCVPYTPNKPAKYGMKIGAACD
Pigibaku7 RPE--CVSIDEQMMVPFT-----GACPCRQYLPKLNVPVGIKNFICAT
TruPGBD1 QHQ--MLCVEKQMVFPFKG-----R-SALRQYSPQKPYKWGYKLFVLC
TruPGBD2 HPY--QHISVDERMVATK-----ARIGLKRYVRNKPTKWGIKLFVLAD
TruPGBD3 VPV--RCLTVDKCSIVTK-----GRFSPAQYMPAKPLRKGLTVWMLCD
TruPGBD4 QPN--CSLAVDRALLPSLE-----EGRLKEDAKVQPEVWLLCD
TruPGBD5 RPS--QTQVLHEPLIDEDPV-----FITCTERELRKRKRKFSWVRQC
HsaPGBD5 RPS--QTQVLHEPLIDEDPV-----FIATCTERELRKRKRKFSWVRQC
Mmupgbd5 RPS--QTQVLHEPLIDEDPV-----FIATCTERELRKRKRKFSWVRQC
HsaPGBD1 PLE--EYYCFDKSMCECF-----DS---DQFLNGKPIRIGYKIWCGETT
Mmupgbd1p PPE--EYYCFDKSMCECF-----DC---DQFLNGKPLQIGYKIWCGETT
HsaPGBD2 PLE--EFYSFGESMCEYF-----GHRGSKQLHRGKPVRLGYKIWCGETT
Mmupgbd2P PLE--XFYSFGESICEYF-----EHWGGGWVGGVQASALR-----EA
HsaPGBD3 PNE--TYFSFDEFMVPYF-----GRHGCKQFIRGKPIRFGYKFWCGAT
HsaPGBD3P1 PNE--TYFSFDESTFPYF-----GRHRCEQFIGGKPIQFGCKFWCGAT

HsaPGBD3P2 PNE--TYFSFNESMVPYS-----GCHRCKQFIQGKPIIMGCKFCCGAT
HsaPGBD3P3 -----DESMVPYF-----GRHWCX-FTQGKPVLFQYKFWCGAI
HsaPGBD3P4 PNE--TYFSFDESRVPYF-----GCQGCKZFIWGKPIRFGCKIWCGETT
HsaPGBD4 TPN--RNIAVDESLMLFK-----GPLAMKQYLPVKRVRFGLKLYVLC
DpuPokey5 KPP--RGQSIDESMVKFK-----GRSVLRQTMKNKPIKSGFKIWSRCC
CinPBD1 KPD--KELAIHEMTVACN-----YKS--EQRVRKKPIQWTDKVYALTE
CinPB1 TPH--KELSLDEMTIAYK-----ERSSIKQYNPIKP-----KVFVLSE
CinPB2 PEQ--SHSVDEQIIIAKT-----KYSKFRQYNPKKPVKWGFKNMVRAD
CinPB3 NLG--EHISIDEGMMKWR-----GRLGFRVYNKDKPIKYG-IKSYILA
CinPB4 NFG--DHISIDEGMIKZR-----GKLGFRVYNKNKPIKYR-IKSYFLA
CinPB5 KPQ--QQLSLDEMTIAFK-----GRSTIKQYNPHKPSKWGYKVFALTE
DmeCG9839 ICG--QQLVLENEPITLWK-----GALRYQDELPNKFRTNALLLHMLTE
DmeCG13151 GCS--SWLTVDETFCAVA-----KSRMTLCCDARTLYMAN
DmLOOPER1m QEE--HQSVDQIIIAFKG-----TFLIFFXSKPHKWGLKMFTRAG
NhaPB LPG--SHLAVDECMIRYT-----DRSDDITVIKSKPDPVGFKIWVIAQ
OsaPB VLG--RNVAVDESSIACRS----KFRHMIVYNACKPTGKHFHFKIYACCC

TniPB SGTK-----YMINGMPYLG-----RGTQTNGVPL
BdoPB SGTK-----YMINGMPYLE-----RGTQTNGVPL
AgaPB1 VDSK-----YVNNIIPYLGKN-----DERPAEERL
AgaPB2 SESS-----YPLKGQIYTG-----LSPSGEREKNQ
AgaPB3 AEPS-----YPINGQIYAG-----LSPSGIREKNQ
AgaPB4 AVTS-----YSIKGQIYTR-----LAPSGQERERHQ
AgaPB5 LZKAKYIQAWQYQVNRZLYNLSYSLKKLREIZCFLFFFLFKTSGERERNQ
AgaPB6 CN-E-----GYTWSMKVYAGKN-----DKEKTKLGV
AgaPB7 CT-E-----GYTWSLKVYAGKN-----NMCKTKMGL
AgaPB8 SS-E-----GFTWASKIYSGKS-----SEGIRETGL
AgaPB9 GT-----GYTYALRVVCT-----KKAQNEST
AgaPB10 GY-----GYTYNCSFYAG-----KIHEKEKTT
AgaPBD1 CETS-----YVSNLEICVPEN-----QNPYNLSYA
AgaPBD2 SL-E-----GYTWGLKLCTEQR-----LIG--EAQL
AgaPBD3 SDTG-----YVLNVELAN-----QLDQ
BmoPB1 ESRT-----GYLWQMEVYTGKGHAVVQDGEPEEERGESDEPESA
Pigibaku1 ATSS-----YAWNLOVYTG-----KPDGGAPEKNP
Pigibaku2 AKSS-----YAWKMQVYTG-----KPTSGCPEKNQ
Pigibaku3 QS-----GFLYDFDVCQG-----AQNPESSEKSEVGV
Pigibaku6 AESN-----YAWNMQVCTG-----KLPGFTSEKNQ
Pigibaku7 TD-----GIVLDFDLYQGSGALR-----EQVEEPEGLSL
TruPGBD1 TT-----GLVHSFEIIFTG-----EIGPAPGQPDIGA
TruPGBD2 SSCG-----YTLNFFVDAGKD-----PEPTGKGR
TruPGBD3 SRSG-----YCHRAKIYVGRP-----VDDEVAASV
TruPGBD4 SKSG-----YCHRLSIQVG-----EKVQQGQ
TruPGBD5 TS-T-----GFICQISVHLKEGG-----SDGLAALKNKPQL
HsaPGBD5 SS-T-----GFIIQIYVHLKEGG-----PDGLDALKNKPQL
Mmupgbd5 SS-T-----GFIIQIYVHLKEGG-----PDGLDALKNKPQL
HsaPGBD1 TQ-----GYLVWFEPYQEEST-----MKVDEDPDLGL
Mmupgbd1p XQ-----GYLVWFEPYQEDS-----GVDKELDLGP
HsaPGBD2 SR-----GYLVWFEPYQETLF-----TKPDRSLDLG-
Mmupgbd2P SR-----GYLVWFEPYQESX-----KPDRLDX--
HsaPGBD3 CL-----GYICWFQPYQGKN-----PNTKHEEYGV
HsaPGBD3P1 CL-----GCICWFZPYQGKN-----XNTKHEEYGV
HsaPGBD3P2 CL-----CHICCFQPYQGKN-----PNTKYEEYGV
HsaPGBD3P3 CL-----GYICWFQPYQGKN-----PNTKHZGYGV
HsaPGBD3P4 CL-----GYIXGFQLYQGKN-----PDTKHEESGV
HsaPGBD4 ESQS-----GYVWNALVHTGPG-----MNLKDSADGLK
DpuPokey5 HR-----GYTYKFEIYQGARFG-----EKQGRSRNNEA
CinPBD1 AR-T-----GYLLEWAIHAGSS-----RETEKGAS-

CinPB1 AR-T-----GYALQWDLYTGKS-----EDVDSSVSK
CinPB2 SS-----GFMYDFYIYGGKDSK-----QLALSDDATHLQK
CinPB3 DSHS-----HYCWNLDMY-----HRVQKTL
CinPB4 D--S-----HYCWNLGMV-----HRVQNXL
CinPB5 AT-T-----GYLLQWEMYAGSS-----METDEDVSK
DmeCG9839 QS-----GLVVKILPEIVRKED-----APAVRNSRQLVEH
DmeCG13151 AVVS-----RNQRC
DmLOOPER1m IS-----GLVYDFTLYVGE-----TSPSYGLGI
NhaPB YG-----FFIRWIHWVK-----EKPHGAV
OsaPB ATTW-----LMVGFRLHCDSDMEDRLRDVIP-AVDAQNLNRLQFSS

TniPB GEYYVKELSKPVHG---SCRNITCDN--WFTSIPLAKNLLQEPYKLTIVG
BdoPB GEYYVKELSKPVHG---SCRNITCEN--WFTSIPLAKNLLQEPYKLTIVG
AgaPB1 GDFVVKLVDPYLN---RGRNVTCDN--FFTSLELA--KFLKSKKTSLVG
AgaPB2 GERVVKDLCHQFRR---SGRNITCDN--FFTFNLAKTLMQD-YKLSILG
AgaPB3 GERVVKDLCRVFRG---SGRNIIICDN--FFTSYNLAISLMED-YKLALLG
AgaPB4 GERVVKDLCRIFRG---SGRSVICDI--FFTSYNLASSLMPD-FKLALLE
AgaPB5 GERVVKDLCDMFRG---SGRNVVCDI--FFTSYNLALSMLD-YKLSILG
AgaPB6 GTNVCFELAEKLM---NEGRTLYIDI--FFTSYELA--LKFLQNKTHVVG
AgaPB7 GSNISVELANLNM---HEGRTLYIDN--FFTSYELA--IQCLK-KSHVVG
AgaPB8 -AHVICIKLAEKLF---EKGRITLYVDN--LYTSYELA--LTCLDRKTHLVG
AgaPB9 TDDVIVSLCEALFN---GGHTLYTDS--RYTSLSMA--TKLLTKRLHLVG
AgaPB10 PVNVVMKLSKLLD---KGHTIXAQT--IGTLYELYEAIEKIIKCKLVG
AgaPBD1 PTDVAMRLTEPVQG---RQKTIVILGAG--LTSIDLI--EKLYASRTMAMG
AgaPBD2 ANSVCMELEPLL---NQGRITVYIDN--FHASFDLA--QALLANQTHLVG
AgaPBD3 VALTDVSIVRPYFG---RWHHVYWGN---DGITVAAAETLYANQTLACG
BmoPB1 TAQIVLNLTRPLF---DKGHTLIMDN--FYNAPLLSR--ILKVQHKTDMSG
Pigibaku1 RNECPRHVSQTQ----WTQHMRH--FFTSKLGQELK--RKLITIVG
Pigibaku2 GMRVVLDTVEGLR----GYNVTCDN--FFTSYELRQQLK--RKITMVG
Pigibaku3 TGEVVLKMTSTLP--AGKNHKVFADN--YFTSVPLV--QHLKERGIHYIG
Pigibaku6 GRYMVLEMSSEQ----GHNITCDN--FFTSYHLGDEHQK--RKLTLG
Pigibaku7 GSLAMARLCQTLHR---GTKVYCDR--LFTSIQGA--EZMMKELYMTG
TruPGBD1 SGNIVLKLAVQVIP--QNVNHLLYFDH--WFSSLDLF--VALANKGIPALG
TruPGBD2 SYDIVMRILNVPFLG--KGYKLYMDN--FYTSPTLFR--DLSRKIWACG
TruPGBD3 GYRAVTSLVRGLEG---QFHHVFMDS--FFTSVPLL--QRLLRNGIYACG
TruPGBD4 GCTVVSSELVKGLEG---KHHHLYLAN--SLASVPLL--QKLLDQGIYASS
TruPGBD5 HSLVAKQLCQNIS---GKNSIIIFTG--PSMTSLSLF--SEFSEQDIFCCG
HsaPGBD5 HSMVARSLCRNAA---GKNYIIIFTG--PSITSLTLF--EEFEKQGIYCCG
Mmupgbd5 HSMVARSLCRNAA---GKNYIIIFTG--PSITSLNLF--EEFEKQGIYCCG
HsaPGBD1 GGNLVMNFADVLLERQYYPYHLCFDS--FFTSVKLL--SALKKKGVKATG
Mmupgbd1p GGNLIMS FADVLLKGGHPYHLSFDS--FFTPVKLM--SALKKKGVKATG
HsaPGBD2 -GSMVIKFDVDAQERGFPLHYHFFDK--VFTSVKLM--SILRKGKATG
Mmupgbd2P -ASMVVRFDVDAQEHSCLPNHIFFDK--VXTSVKLM--SILRKGKATG
HsaPGBD3 GASLVLQFSEALTEAHPGQYHFVFN--FFTSIAL--DKLSSMGHQATG
HsaPGBD3P1 GASFTLQFREALIEAHPGQYHFIFDN--FFTSIAL--DKVSSMGHQATG
HsaPGBD3P2 GASLIHKFSEGLX-THPGQYHFVFDN--FFTSIAL--DKLSSMEHQATG
HsaPGBD3P3 VESLVRQLSEALTEAHPGQYHFVFDN--FFTSIVL--DKLSSMGNRATG
HsaPGBD3P4 GASLVLHFGEAITETHPGQYHFVFDN--FFTSIAL--DKLSLMGPQATG
HsaPGBD4 SSRIVLTLVNDLL---GQGYCVFLDN--FNISPMLFR--ELHQN-RTDAVG
DpuPokey5 VERVVVLDLQPLTD---QGFFVAFDR--FFTSIAL--DKLRENGVNAVG
CinPBD1 ---IVRKLCTRYI---GK-HDIYINTANSYTNRNL--KEFVSQTNGSG-
CinPB1 THAIVRKLKQEYL---HKGHDIYMN--SYTNPYLA--NELSKLKTGVCG
CinPB2 SAQTVVKLCQHLP--VKQNHQLFFDN--WFTTLDLL--IYLKEIGINACG
CinPB3 KETVSQILTSKCH---FLWHSLYMDN--FYNSVSMS--QMLLAFQIHSVG
CinPB4 KETVSQLLTZ-----LYMDN--FYNSVSMS--QIXLAIZIHSVV
CinPB5 THSIVRKLCSGYM---GKQHEVYMN--SYSNPYLA--KEFKEKKTGICG
DmeCG9839 RNKIVLKLMEGYHG---GRTVYTSK--FYGSYGLA--QELAKKSTYCTG

DmeCG13151 PDKDVEQLICDFKT---TGRNVTLGS----RYLNLTQCEQLAQRQISSLG
DmLOOPER1m SSVVVLVLAESLPK--DKNFKLYFDN--WFTSVILL--ISLKEIGIFATG
NhaPB GVEFQLRSHHHKVG-----QASEEKSQSKP
OsaPB VRQIVLEVTRPIHN---TQRVVNTDN--WYTSVTLM--LSLRDVGLYGRG

TniPB TVRSNKREIP---EVLKNSRSRVPVGTSMFCCFDGPLTLVSYKPKPAKMV-Y
BdoPB TVRSNKREIP---EVLKNSRSRVPVGTSMFCCFDGPLTLVSYKPKPAKMV-Y
AgaPB1 TINKARREVPICVKKVKEKLYFTKAFKSD-----DTTLTVYQGKTKKNVV
AgaPB2 TVNKRRTFVP---FELMVTKGRETESTKFVFNQNNVTMC SYI PKKNRSV-L
AgaPB3 TVNKRRTFVP---SSFNSPKGREVLSTLFGFSENV AICSYV PKKNWAV-V
AgaPB4 TVNKRRTFVP---PMFANPHGREIQSTLYGFSENI SICYYFLKKNKSV-V
AgaPB5 TVNKRRTFVP---AFFVKPKGRIP ESTLFGFSENVCLCSYVXKKNKCV-I
AgaPB6 TLRFNKKYMPKEVMVSKLK---KGEMISK---EDPNGIVVLKWRDVRD-V
AgaPB7 TLRYNKKYMPKCVMDKPLK---KGEMVSR---EDPNGIVVLKWKDSRD-V
AgaPB8 TLRHNKKSMPRDVLDCKLK---KGEMIX-----VGIVVLKWKDSRD-V
AgaPB9 IFNPGRPGNPPAVVSKQLAAGETFAMEKS-----KSITVLKWKKEQE EV
AgaPB10 EFIAKENS-----NGITVIKWKKNKRD-V
AgaPBD1 EVPKSYPDLPKALIANKGRPEHSTLAAYHD-----PATLVSYVTRRKEVM
AgaPBD2 TVRVNGSSMPKDVLLAKLR---KGEI IAR---ENDDGVMVLKWKGTCT-M
AgaPBD3 TLRNDPDGTVAPERK-----SPVLVMDGQGKRILS
BmoPB1 TLRNLNREFVPEALKKKTKKNMKEGEVAFS---TT-KDLSVVVWMDKNI-V
Pigibaku1 TIRKNRSELP-QQLLTSKNR--PVKSSQFAYTADTSLVSYVPKKGKNV-V
Pigibaku2 TVRKNKPELP-PALLASKKRGLLIKVS LHAHHS----SFI PPKEKQE-C
Pigibaku3 TIQINRVKDCAMMDEKELKKNGRGSMDFR---VNQDNNI I VRWYDNKA-V
Pigibaku6 TVSRKKPELPRESSXILKMQRPLHSSIFAFTEKATVVVSYF PKQNKV-X
Pigibaku7 TVMKNCSIAEVTYXDKSMQNA GRGTSTEV S--TEDGKLCVVKWFDK KP-V
TruPGBD1 TIQQNRLRGCTFSADSEMKNKDRGAFEEQQAVVDDVGI RVVKWFDNRG-V
TruPGBD2 TLRPNMAGYPKKGNDMTDKT PRGTIRWMR----QGELLFVKWLDARQ-V
TruPGBD3 PTPQGRKGYPEVLRPRNIGKLSQGEFYQCQ-----RGNLVATVTRDLKVV
TruPGBD4 SFPQFSPILPRELWEEGSLDKPGDFHQKQF-----GPLLVTRWRDMKEMG
TruPGBD5 LLSTRKSDCTGLPQSMLVCGSTPAQRGQSR-IMMKGSLSLISWYNKGH-F
HsaPGBD5 LLRARKSDCTGLPLSMLTNPATPPARGQYQ- IKMKGNMSL ICWYNKGH-F
Mmupgbd5 LLSSRKS DCTGLPPSMLTNPATPLARGQH Q- IRTKGNMSL ICWYNKGH-F
HsaPGBD1 TIRENRTEKCP LMNVEHMKMKRGYFDFR--IEENNEI ILCRWYGDGI-I
Mmupgbd1p SLCENKTXKCP LMNVELMKMNXGYDFDI--VEEKEE IFLCRWHGDGF-I
HsaPGBD2 TVREYRTERCPLKDPKELKMKRGSFDYK--VDESEE I IVCRWHDSSV-V
Mmupgbd2P TVCEYRIERCPLKDPKELRKTRRYSFHYR--VEESQE I IVC-----HV-V
HsaPGBD3 TVRKDHIDRVPLESDVALKKKERGTFDYR--ID-GKGNIVCRWNDNSV-V
HsaPGBD3P1 TVRNDSTDKAPLEZDIVLKKKERGTFDYL--ID-GKGN IACRWNDNSV-V
HsaPGBD3P2 TVRKDRINKAPLES DVALKKKE- I I FNYG--ID-GKGNV VCR-----
HsaPGBD3P3 TVRKDHIEKAPLKL DVALKKKEXGTFHYZ--ID-GKGS LVCRWNDNSV-V
HsaPGBD3P4 TVRKYCIDKAPLESAAALKKXDRGKFDYR--ID-GKGSTVCRWNDNSV-V
HsaPGBD4 TARLNRKQIPNDLKKRIAK----GTTVAR---FC-GELMALKWCDGKE-V
DpuPokey5 TILPSRVNQPI MTKNESNLRPDEF AAKFGG-EPGTCRKGIFVWRDTKA-F
CinPBD1 -----GIPGELKTINEKNNP-----V
CinPB1 TISATR---KGMPE SLKKKLNKTKKGDDPI-FLRSGDLLACAWHDVRR-L
CinPB2 TIRGN-----EDLKKNGRGAVDFR--SDFNSGILVTKWYDNNA-V
CinPB3 TLRN SRG-EPREIRTPPNQ-MKKGDI IAR---QN-QSVTVLAWKDKRV-V
CinPB4 TLRN SRG-EPCEFZTPPIQ-MKKGDI IAR---QN-KSITVLAWKNIRV-V
CinPB5 TINCNR---KGMPELKKKLNKTKKGDDPV-YMLSGDILCCAWHDTKR-L
DmeCG9839 LLDRNRYGNSKALVHQRLDSNSISTSYATS-----LMMAKWRRRAKSL
DmeCG13151 KLEANS PHWPRQWPTESPLFGGSSKLIPLD---GDAVFCCGLSSQVDAV
DmLOOPER1m TVRMIKX-----QPVVICKRWSPKAKA
NhaPB LI-----
OsaPB TIRENSAHFPKAHMF AKKANEP RGS SLOG--VSNTGQMIAASWMDGSA-V

TniPB LLSSCDEDASIN-----EST-GKPQMVMYYNQTKGGVDTL

BdoPB LLSSCDEDASIN-----EST-GKPQMIMYYNQTKGGVDTL
 AgaPB1 LLSSMHRDIRTG-----NDKKS KPETVAFYNSTKYGVDDV
 AgaPB2 LISTSHYDTKTH-----GPK-KKPTMMLDYNKYKGGVDTM
 AgaPB3 LLSTFH YDTEIQ-----GPK-NKPRMIADYNRSKGGVDNM
 AgaPB4 MLSTMDYDKDVQ-----GPK-EKPAMI IDYNKFKGGVDNM
 AgaPB5 LMSTSHYDMEIT-----GPK-NKPKMIDDYNKLKGGVDNM
 AgaPB6 RMISTKHAPVLVSTTSASKP-----QRTEK LKPVAVIDYNQKCGIDKS
 AgaPB7 RMISTKHVPR LMPVKS AKNP-----KSKEKMKPLAVIDYNLGKCGIDKS
 AgaPB8 RMLSTKHAPYMQVTTKKCYSN-----QPATK LKPLTVVDYNKGGKCGIDYS
 AgaPB9 LLLSTKHSFEMMKIECR-----GSSKRKPRIVIDYRRGKAAIDLA
 AgaPB10 LMLSTKHSDKMVIAKIKN-----RYVLKPKI IYLNSK KKKKN-----
 AgaPBD1 LLMSSFVDFDSEEQAGEQ-----DEGEQHLK LVELYNRKTTTIRTI
 AgaPBD2 GLLSTKHSPALVPMESQVRSNRR--WIRVARIQPEAVIAHIQAKGRPDRS
 AgaPBD3 TIHGAAAMQPTG-----EPQGPPACVADLNRHLADLERF
 BmoPB1 AMISSFHPIEVGGIEK-----YGYRYKPKQVVL DYNFMSGGIDHK
 Pigibaku1 LMSTLHRDGRMC-----DQEHKPEIIMDYNATKGGVDNM
 Pigibaku2 SSSEHTAQIRZH-----ZRSWQEAIILDYNRNKGGVNNL
 Pigibaku3 NLISSFVGI EPVGNV KRWRDRKS---KTHIMVPRPAIVETYNKFMGGVDLL
 Pigibaku6 YIEYNPTDVSL S-----TREDKKPQTTLDPGQLD-----
 Pigibaku7 LMMSAVHGTQPEDTCQRWDKIQ-----KKYVSRPSIVREYL-KMGGVDLI
 TruPGBD1 IVASTFAGAQPVSIIERWERKL---KRNVSVECPSIISLYNKFMGGVDAL
 TruPGBD2 NMCSTMHKAYSNDTAMRKVKNAKGEWTVKRVPIPGCIKDYNQHMGGVDLS
 TruPGBD3 SCLSTNSAPGIVGISPDQREGE-----AHGDEERDSMESSGASYGHAATF
 TruPGBD4 CLSTNAAPGEHDTVWRRSQTKVG---ELDPVHRPLAFRL LQENMRGVDIC
 TruPGBD5 RFLTNSYSPTRQGMIIKRKSGE-----IPCPLAVEAFAAHL SYICKY
 HsaPGBD5 RFLTNA YSPVQGVIIKRKSGE-----IPCPLAVEAFAAHL SYICRY
 Mmupgbd5 RFLTNA YSPVQKGVIIKRKSGE-----IPCPLAVEAFAAHL SYICRY
 HsaPGBD1 SLCSNAVGI EPVNEVSCC DADN---EEI PQISQPSIVKVYDECKE GVAKM
 Mmupgbd1p NICSNAVGI EPVSKASCV-ADD---KEXSFLQVTSIVKLCCEECRKGVAKM
 HsaPGBD2 NICSNAVGI EPVRLTSRHS GAA---KTRTQVHQPSLVKLYQE KVGGMGRM
 Mmupgbd2P NICSNVVGI EPVRVPSHHPGAA---KAQAQVHQPSLVKLYQE KARGVDZM
 HsaPGBD3 TVASSGAGI HPLCLVSRYSQK---LKKKI QVQPNMIKVYNQFMGGVDRA
 HsaPGBD3P1 TFASSGAGI DHLCLVSYYSWK---QKKKTQVLQPNMNKVYNWFMGGIDRA
 HsaPGBD3P2 -----
 HsaPGBD3P3 TVASSGAGI HPPCLVHRYSQNN EZLKKXTQVQPNMIKVYNQCIGSIDSA
 HsaPGBD3P4 TIIASSGAGI DPLCLVSSYSQK---LKKKI QGQPNMIKXYNQFMGVIHTA
 HsaPGBD4 TMLSTFHNDTVIEVNNR-----NGKKT KRPRVIDYNNMGAVDSA
 DpuPokey5 RVASNYHGSNLVKVRRKQRDGS-----FKTKSCPKAIDDYVNNMGGVDTA
 CinPBD1 CAKS AVRSSEI KAKSATQKGNKR---SYNDM KKANSKKRYN-YLSGVIPI
 CinPB1 TMLSTIHNASSTETTIRSKKVD T---GTRTILKPI CVAEYNRHMGGVD RM
 CinPB2 HIGSNFVGI EP MSTIDRWSSEI---KEKVPIQCPQIITMYNKGMGGVDLA
 CinPB3 KAISTKH DASVTTITRRQRRG---EXESVEKPVCIADYNLHMSGVDQV
 CinPB4 KAISTKPDASLTTITRZQRRGX---EKESIKKPVCI TNYNLHMSGVDQV
 CinPB5 TMLSTIH DAGVSEKIRSKTSET---GTRMVMKPN CVTEYNKYMGVDRI
 DmeCG9839 YCFSSDCLAIYSKEMAMQKTN-----AKPKLIQELEFQLRPGNDG
 DmeCG13151 QAYEQTSEACQ QFYEHSQR FSTAHATPAPLKKQINPFLQLLHFV LNAAAV
 DmLOOPER1m YIDISG-----PAIVALYNKGMCGVDLA
 NhaPB -----
 OsaPB NILSNADSSGMGEVTRMIGKER-----VVFPA PKCVAEYNKYMQGVDR L

 TniPB DQMCSVMTC SRKTNRWPMALLYG--MINIACINSFIIYS-HNVSSKGEKV
 BdoPB DQMCSVMSCSRKTNRWPMALLYG--MINIACINSFIIYS-HNVSSKGEKV
 AgaPB1 DQMCRKYS LKSASRRWSVHSFFN--ILDLAGINAWVLYKELTKEN-----
 AgaPB2 DQCLAHFTTKRKT RRWPLAFFYN--ILDIAAYAAYITYMGNNPHFNSTN-
 AgaPB3 DKCLFEYSCKXEDKSV AISIFYN--ILDVA AFAAYKIYKENNP NLYNAI-
 AgaPB4 DKYLSEYSTKRKTNRWPLAFFFN--ILDRAAFAAFKIYKENNLQNCQST-
 AgaPB5 DKYLSEYTTKRKTNRWPLAFFYN--LLDVAALAAFVLYKENNPQYNTSP-

AgaPB6 DQMISYATHSR-RSQKWHYKLLALYLLTGTSSVVNAHIVYQKANNI-----
 AgaPB7 DQMVSNAATHIR-RSRKWHYKLLAMYLLIGTSVVNAHIIYQKINNI-----
 AgaPB8 DQMVSYATTMR-EGVKWYRKLGLIELLLGTSVVNALVVFKTATKR-----
 AgaPB9 DR-MNAYSLTLCKAMQWYRKLGFDLLLNTALANAYLLYKDATN-----
 AgaPB10 -----
 AgaPBD1 QQMCAKHNVRSTRRWPVAVFFN--LMNLSAINAWCIYCLNHPEEAK---
 AgaPBD2 DAIGPHITDLR-KGMKWKYQVGLVLLLQVCVTNAWILHRMVTCK-----
 AgaPBD3 EGLLVEEYLSNASVGHIRTVLL--LINVALLNAYILFSQTDGT-----
 BmoPB1 DQMLSAYPIERSRNI IWYKKLFR-RLNVM SMHNALVMFN-HNRT-----
 Pigibaku1 DKLVTAYSCKRRTLRLWPLVIFFD--MLDISAYNAFVIWMALNPEWKRVKL
 Pigibaku2 DKVIGTYSYRSMTAHWPLIIFHN--IIDVSSYNAFVIWREINPSWMSRKQ
 Pigibaku3 DMLSALYKFSF-RSRRWYMIWW-HTVTVAVINAWKFYRRDQKKL---EP
 Pigibaku6 -----
 Pigibaku7 DRMISYYCMSTRTKKWTMRMLMH--FTDLALANSWLLYRKDLTTZ--DAP
 TruPGBD1 DALIAYHRIHI-RSKKYHRLFF-HFVDM AIVNSWLLYRRDCESLG--VP
 TruPGBD2 DALISYYNVLHKTLLKWKTLFYH--FVDIATVNAFILHKEMCKLQ-----
 TruPGBD3 APAAVPGEHEGRRPLRPAEGVLPGGPGRARSGGATSCGSTSTCASSTPTS
 TruPGBD4 KQLLACNPLGGIPQDKHWRNLFW-FLVNLSIVNAFIMLRESRKDSPPPWW
 TruPGBD5 DDKYSKYFIFHKPNKTWQQVFWL--SISIAINNAYILYKMSDAYA-----
 HsaPGBD5 DDKYSKYFISHKPNKTWQQVFWF--AISIAINNAYILYKMSDAYH-----
 Mmupgbd5 DDKYSKYFISHKPNKTWQQVFWF--AISIAVNNAYILYKMSDAYH-----
 HsaPGBD1 DQIISKYRVRI-RSKKWYSILVS-YMIDVAMNNAWQLHRACN-----
 Mmupgbd1p DQXISKYRVGL-RSKKRLWVLS-YMVDVAMSNAWQLHRICN-----
 HsaPGBD2 DQNI AKYKVKI-RGMKWYSSFIG-YVIDAALNNAWQLHRICC-----
 Mmupgbd2P DQNI AKYKVKI-XGKKWYLSFTS-YVIDAALNNVWQLHRMCC-----
 HsaPGBD3 DENIDKYRASI-RGKKWYSSPLL-FCFELVLQNAWQLHKTY-----
 HsaPGBD3P1 DKNFDKYQAAI-HGKNWYSSXLL-FCFKLVLQNAWZLHKT-----
 HsaPGBD3P2 -----
 HsaPGBD3P3 DENIDKYRASI-HGKEWHSSPLL-FCFELVLQNAWQLYKTY-----
 HsaPGBD3P4 DENINKYQASI-CGNKZYXSPLL-FCFKLVLQNAWQLHKAY-----
 HsaPGBD4 DQMLTSYPSEKRHRKVWYKFFH-HLLHITVLSYILFKKDNPE-----
 DpuPokey5 NQLRSYERDRKAKKWHRLLYS--LLETCLVNSWICFN-----
 CinPBD1 FRQLN--LFRHKTVKWSLRIFEN--LAQICVNSYILYTSKTSDS-----
 CinPB1 DQRMKTYIFPHRSWKWMRIYDG--IISIAMVNAHIIISFSCPSSS-----
 CinPB2 DMLISLYRTEV-KTRRWYIKIFW-HCIDIAKVNAWLLYRRHCNEMS--IS
 CinPB3 DQM-ISYYPCHRKSLKWTKKVFF-YFMTISVHNAYILYKSKSSA-----
 CinPB4 DQMKIVYYLCHHKSLKWTKKVFFYFIKISLYNAYILYKSKSMA-----
 CinPB5 DQIRTYLFPHRSRKMWMRIFDN--LIQICLVNSHVIYNTLPSGS-----
 DmeCG9839 RHHLIHYQAACKELKANI KLTIF--LLNILVYNAYLLYFANGQONAR----
 DmeCG13151 NAWILLRLSPKGDAAMDQRDFQRQLGLFLTQQLQRRLQRRSTSTS----
 DmLOOPER1m DMMELYKINNRSTFFIVAWEYSLQKLRIRIGNSSZZPQNKNI FS--LS
 NhaPB -----
 OsaPB DQLRAKYSLADGHSMQKWHKKLALAFIDIARVNAYVTCKLRDDKP-----

 TniPB QSRKKFMRNLYMSLTSSFMRKRLEAPTLKRYLR-----DNISNIL
 BdoPB QSRKNFMKNLMSLTSSFMRKRLEAPTLKRYLR-----DNISNIL
 AgaPB1 ISRRDFLFLKGEELAEYVENKSANAN-----
 AgaPB2 YTRRVYLQQVAEQLGMEIVSRSQNAQIMRHFG-----PRSGIES
 AgaPB3 NYRRLFLKDLCEQLCTKEIQRRSENTQIMRHFG-----PRSGVES
 AgaPB4 DYRRMFLQQLSEQLTMPVIQRRSENVQLMRHFG-----PRSGVES
 AgaPB5 NKRRMFLQQLCEQLAMPEIEIRSTDIQIMRHFG-----PRSGIEA
 AgaPB6 -KIG--IREFREKIVHEWLCSEYPDIEE-----
 AgaPB7 -SIT--IREFRELVVQEWLC-----
 AgaPB8 -NIG--IREFREMIASELLQLPVKNTTK-----
 AgaPB9 --KQVSISEFRKELTVHLTQFYPAETIDP-----
 AgaPB10 -----
 AgaPBD1 MSRRDFLVTMALELLRPQARRRLDSKTLPR-----

AgaPBD2 -KLK--LATFREQLVDQLVPLPNPTVERGLS-----
 AgaPBD3 --SRFTFNVFRLAVAREWVGASEPLEEP-----
 BmoPB1 -HALRHRE-FRLQLAKQLLQSSRSAAPSR-----
 Pigibaku1 QKRRLFLEDLGKALVRPQIERRKHIPRTPASAA-----MVRRIQK
 Pigibaku2 NKRRVFLEQLGKALATPLIERRKHVPRTEASAA-----VVKAIQS
 Pigibaku3 QMKPMGLRRFQALVGTSLTSAGKTKIKCGRPPSS-----PEAT---
 Pigibaku6 -----PQQHPSAI-----IGKVKLR
 Pigibaku7 RKSIMQFLEFRVEVARTFLAQQYSQEDDADFPEL-----SEGEDDST
 TruPGBD1 RRKRKDLLAFRASVAQALCMEGKDPMRQKRGRPS-----LDVDGQF
 TruPGBD2 DRPELKQKAFREQLILSLAGIGSTPRRSAPQNHPLAVAAAPAAPSSSQVP
 TruPGBD3 SSGRAEGARRPPGFNGKQFTQRHFRVRLAQQLIG-----DY
 TruPGBD4 QDGLFTQVI FRKRLGNQLAKCGQKYLDPGE-----
 TruPGBD5 VKR-YSRAQFGERLVRELLLEDDCSPTQ-----
 HsaPGBD5 VKR-YSRAQFGERLVRELLGLEDasPTH-----
 Mmupgbd5 VKK-YSRAQFGERLVRELLGLEDSsPAH-----
 HsaPGBD1 PGASLDPLDFRRFVAHFYLEHNAHLS-----
 Mmupgbd1p PGSPLDLPGFQKCVACFRLGHANLS-----
 HsaPGBD2 QDAQVDLLAFRRYIACVYLESNADTT-----
 Mmupgbd2P QDRQGDLLAFRRHVASGASGEQXQTSS-----
 HsaPGBD3 DEKPVDFLEFRRRVCHYLETHGHPPE-----
 HsaPGBD3P1 DEKPVDFLECRWRVCHYLQTHGHPPE-----
 HsaPGBD3P2 -----
 HsaPGBD3P3 DEKPIDFLEFGZ---CHYLETHGHPPE-----
 HsaPGBD3P4 DEKPVDFPEFHRRVCHYLKTHGHRLK-----
 HsaPGBD4 -HTMSHIN-FRLALIERMLEKHHKPGQOHLR-----
 DpuPokey5 -----DMVRSQMAEIKTSNTQ-----
 CinPBD1 SDK-MDLKKYIEACVSGLLVDYNPHITEKWRP-----
 CinPB1 NKKPKSLKQFIEEIASSELLNGYTSARKRAGKQ-----
 CinPB2 KKSQRTLLNFVVDISDNLLYRNSCSTP-TRGRPS-----NKRKLEN
 CinPB3 -KSCKTLYSFI LTLVSQLCQQDRLQPIDDE-----
 CinPB4 -KLYKILYSFILKLVSQLCQQDRLQAEVDDD-----
 CinPB5 NEKKLTLKFYIQECITGLLQEYTPG-VLSPRR-----
 DmeCG9839 VGHLKSYSEFRVIIKSLLRREEVTNEPVTSIQKP-----ETYER
 DmeCG13151 LVMRLQICEILGQSSQRLLESEATGEAKLTHSVG-----VL
 DmLOOPER1m NFNRLKPMNFYIPLALLHLKKETSKNKZRTRKLS-----SI
 NhaPB -----
 OsaPB --LRNQHRQFMIELASELITGKWNDDTVENEGMVFADDQLSTTSRSTTGY

TniPB P-----NEVPGTSDDSTEPEVMKKRTYCTYCPSKIRKANASC
 BdoPB P-----NEMPGTSEDSTEPEVTKKRTYCTYCPSKIRKATASC
 AgaPB1 -----LPMTNAGGSRRRYKVQTSCHEGKSANECFTCNRPVCKKCTK
 AgaPB2 MLGKPINPV--VVNVPHVSEERDVTG-RIQQKGKCHLCVKRRATRKECSL
 AgaPB3 MLGQSLASTLRQHVDAYSEEIRDASG-RLKHKGNCYICKKRRSTRKSCGK
 AgaPB4 MLGGPLIALSKKNTTKDVEE-RDVSG-RIKHKGNCYLCVKKRSTRKSCST
 AgaPB5 MKGGPIKSP--DTNETMTPTKRDASG-RVKHTGTRFLCVKKRPTKRVCDZ
 AgaPB6 -----LENLKPTPN-DIVENFVDNYVVEETFVPAACMEENGSEK
 AgaPB7 -----LSMVETMIGFKTQHYFERKPGVTHTVRRYCKQCYAENVARLGR
 AgaPB8 -----
 AgaPB9 -----
 AgaPB10 -----
 AgaPBD1 -LLRQRIGLFLGISREEYETVPVVERQGGESRGRCYLCGRARNKTTRISC
 AgaPBD2 -GGEKKYTHHLEVRTDGNRTVRRSCANCYAESRKTMSHYEAGRKKATT
 AgaPBD3 -----TKFLPLIRGRKRKFLPLIPGRKRKETGLHNRVPKHPARN
 BmoPB1 -LAPAARPEPAACIRDMHLP-----GKNTKKQRCKLCYSAKVQR----
 Pigibaku1 ENAGALSTQPTPEQSAEPEVNVZVNVNNSNKKKRCVCGPKMDRKTQYTC
 Pigibaku2 --AGAP-DQPEVPATTATSPAR-----ASKRKRCQFCPQKDKPHTVC
 Pigibaku3 ATPPRKRPSCSVP-LDMRRDGDIDHFPTWET-RQRCKHCTGNHFSHYCEK

Pigibaku6 -----STSSGHRZ-----KEGKRCQVCPSREDNKTSTSZ
Pigibaku7 QGKRRPVMVPHVSVRRRANAHLPEMISLKNAARCRAAGCTGRTRVRCVT
TruPGBD1 EIKKRRGPAKAI PPQEVRS DAVGHWPVVENGRQRCCLPNCKGQTVYKCAK
TruPGBD2 DTTPTAPASSHLPAYFVEHMNDVT PRFRATLGRRTCVLCKRKS PVYCST
TruPGBD3 QGARGMERAARKRHADS PVEYGHRLERMSERSRRCRNCTNKGLRHESVFG
TruPGBD4 -MARSRTSIGPTEELVKERHRLAKISTFSKRCKNCNLKNLRHESVYGCST
TruPGBD5 -----
HsaPGBD5 -----
Mmupgbd5 -----
HsaPGBD1 -----
Mmupgbd1p --Z-----
HsaPGBD2 --QGRRSRRLLETESR---FDMIGHWIIHQDKRTRCALCHS--QTNTRCEK
Mmupgbd2P --QGRRSWRVETESR---LDMIGHWIVHQDKRIPCALCHS--QTNTRCEK
HsaPGBD3 --PGQKGRP-QKRNIDSRYDGINHVIVKQKQTRCAECHK--NTTFRCEK
HsaPGBD3P1 --PGQKGRPSQKHNDISHYDGINHMIVKQKQTRCAECHK--NTTFRCEK
HsaPGBD3P2 -----
HsaPGBD3P3 --PGRK-----
HsaPGBD3P4 --PGR-KRPSQKHNTDSYYDGINHGIVKQGMQMWYAECHK--NNTFQCEK
HsaPGBD4 -GRPCSDDVTPRLRSGRHFPKSI PATSGKQNPTGRCKI CCSQYDKDGKKI
DpuPokey5 -----
CinPBD1 -PQPGTVLSRILPPQYVHKIIKIDKKPQCVVCSDSRRKLGRRQTSFMCEK
CinPB1 -QSP-LHFKRLIPFQHQHFLGK--TTRKSCQCCN-----KQTMTLCKK
CinPB2 DTLPGKKPFTPTPNEILRFDQISHWPEPRSQRGRCLCKS-GYSQIYCSK
CinPB3 -NLAGPPPKSPRIDSTKRLK-----GGFKKHVIALYPPTKKKAAAQ
CinPB4 -TVAGPPPKSPRINSSNRLK-----GGFKKHVIVLVLPTKKKTAAQ
CinPB5 -KSK-DTISRIVPDQYYHKLIIKEESSKPNCAVFF-----LSVZANTRD
DmeCG9839 SKNKPVPEPRLKTI LHEPMLIQONGKPAKKNCRYCHKGGMLQFSRYMCNT
DmeCG13151 TPDKMSLPLGINLASRYGEKHRRCKPCARNKRGTKSRTRCQQCLQHRCGN
DmLOOPER1m IGIPKQCLFASIKEVQIFDKSYXEHVWVFGGERGRCLCKT-ATPMTKCLT
NhaPB -----
OsaPB KAPSTVASPTPPCDVVL SLTRFPEATRGKRGCKVCMFEGRTWTMKTLYCI

TniPB KKCKKVICREHNIDMCQSCF-----
BdoPB KKCKKVICREHNIDICQSCF-----
AgaPB1 RISYVCVSCEPGSDEAM-----
AgaPB2 CCKPVCVEHSSNKVVCKNYVSTTNT-----
AgaPB3 CEKPVCASHSSNRIYCNQCK-----
AgaPB4 CKKPICTLH SVIKTSCKPCD-----
AgaPB5 CCKPVCTQHSKIITKCDHC-----
AgaPB6 NVLWQMAKYTSNVHEL FQRVPLMLFEQLWC-----
AgaPB7 YV-----
AgaPB8 TNCPSCPDQPQLCDECFKIVHQK-----
AgaPB9 TSKIVTKKVATYCRNCEG-----
AgaPB10 -----
AgaPBD1 HSCGKYTCNAHCAQLCRTCYMDDCASEQQE-----
AgaPBD2 TFCGSCPQKQPQLCMPCFNKLH-----
AgaPBD3 -----
BmoPB1 ---STVWRCTLQCHLCIV-----
Pigibaku1 IKCKKYICNTHTVKWLWPCVV-----
Pigibaku2 CKCKKYICKSCALAYCPTCAN-----
Pigibaku3 CKVHLCLNKEINCF SAYHKVK-----
Pigibaku6 LNFKNYICR-PTVTFPCSCGEQZ-----
Pigibaku7 CKVFLCLQTELNCYAAFHTZ-----
TruPGBD1 CNVHLCLNKVNNCFCEFHK-----
TruPGBD2 CKKTLCF TSLRNCYRDWHRSNSICT-----
TruPGBD3 CKICNVHLCRGGCFSEFHK-----
TruPGBD4 CGVNLCKQPSCFWEFHGLPPLHKGCN-----

```

TruPGBD5 -----
HsaPGBD5 -----
Mmupgbd5 -----
HsaPGBD1 -----
Mmupgbd1p -----
HsaPGBD2 CQKGVHAK----CFREYHIR-----
Mmupgbd2P CQKGVHAK----CFQEYHFP-----
HsaPGBD3 CDVALHVK----CSVEYHTE-----
HsaPGBD3P1 CNVALHLK----CSVEYHTE-----
HsaPGBD3P2 -----
HsaPGBD3P3 -----
HsaPGBD3P4 CDVTLHVK----HSVEYHTGQ-----
HsaPGBD4 RKETRYFCAECDVPLCVVPCFEIYHTKKNY-----
DpuPokey5 -----
CinPBD1 CNVALCVVPCFHRYHTLKNYRVCHLDM-----
CinPB1 CNVSLCALDCFERYSLSLQEYRMK-----
CinPB2 CHVCLCLKSSNNCFKEFHCKN-----
CinPB3 RPCRACMKNGCRKDTILL-----
CinPB4 RRCRVCMKNSCRKDARYYCAYY-----
CinPB5 YPNDLKCKQAIRGKSREKDFWYICLEITIZ-----
DmeCG9839 CPDKPGLCQEPCFLLWHEQLKKVIRQTIGRSE-----
DmeCG13151 HLI SRCYECV GILPGQLPEGNMVDEGAT-----
DmLOOPER1m CKVHLCCNNNKNCFFVI PHLNCHYKEYFIFCDL-----
NhaPB -----
OsaPB RHNVCLCTKSYSLNQSLADVVC PHTDWT SWQKYNDYYLPNGIFDEHGR
;
end;

```