SEQUENCES

Amino acid sequence for a phosphoketolase enzyme from *Mycobacterium gilvum Spyr1*

MTTATTAERRPLSDQDVDRLDRWWRAANYLSVGQIYLLDNPLLRTPLTREDVKPRLLG
HWGTTPGLNFLYAHLNRAIAQRQQSTIYVTGPGHGGPGLVANAYLDGTYSEIYSDITQD
DEGLRRLFRQFSFPGGIPSHVAPETPGSIHEGGELGYALSHAYGAAFDNPDLLVAAVVG
DGEAETGPLATSWHSNKFVNAAKDGAVLPILHLNGYKIANPTLLARIPTDELRALMVG
YGHHPYFFEVPDDEGGPGVDHADAHRRFARLLDDVLDEIADIKTRAREGDESRPAWPM
IVFRTPKGWTGPDYIDGKKTTGSWRAHQVPLSNARDTKEHLAVLSDWLSSYRPDELFD
ADGRLLPEIAELAPSGQLRMSDNAHANGGLLLKDLRLPDFREYAVDVPAPGATVAEAT
RVLGQWLTEVIRLNPDNFRIFGPDETASNRLQAVYDATDKQWNAEFFGAEVDEHLARA
GRVVEMLSEHQCQGWLEGYLLTGRHGLFNCYEAFIHIVDSMLNQHAKWLKVTNHIPW
RRPIASLNYLLSSHVWRQDHNGFSHQDPGFIDHVVNKSAKVVRVYLPPDANTLLSTYD
HCLRSRQYVNVVVSGKQPSPNFLTMEQAVAHCTRGLGIWEWAGSEELGTDPDVVLAS
AGDIPTLEALAAADILRQHLPDLKVRFVNVVDLMRLQDSTEHPHGLPDRDFDMIFTTDR
PIIFAYHGYPWLIHRLTYRRAGHDNLHVRGYKEEGTTTTPFDMVMLNDLDRYHLVMD
VIDRVPSLGSTCAALRQQMADKRIAAREYTRAHGEDIPEVKDWVWPAARESGFGTAGA
DGASSTGGDNE (**SEQ ID NO:1**)

Amino acid sequence for a phosphoketolase enzyme from *Shewanella baltica OS185*

MTQIHEINALKKYVRATNFLATSQIYLKQNVLHKRPLAHTDIKPRLLGHWGTCPGINFV
YANINRLIVKHNRSFIYLVGPGHGFPAVQANLFMEGSLSHFYPETIPYNETGIEDICKKFS
AAYGYPSHANPEAPGQILEGGELGYSLSVGWGAVLDNPDLIATVLIGDGEAETGPLAAS
WYANRLVSPATSGAVLPIVHINGYKISGPTRMGRMSHEELDLEFRGLGYFPIIVDNELEE
DIYVQMTNAMDTAYAMINDIQRRARSGEDVVKPKWPVILMRTAKGWTGVSEYKGKK
LEGNCESHQVIVNKCATDKGHLDALDNWLASYHFQELYQMNDKGELIFDADICSLIPPK
QLACGRQHLTYGGEVVRALTNPDLEKLSYGPEVPRGHRGYSMLKMGEWMRDAFKLN
RDQRNLRIFSPDETYSNQLQAVFEETDRAWQWPIESWDEDMSREGRVIELLSENLLFGM
LHGYTVTGRHGMFPTYESFSQVISSMADQYCKYVYASQGVHFRKPLPSCNVVLSSLLER
QDHNGYSHQNPSFLGAMLEKHPKIISAYLPADANSTLVYTERAYADRDKLNILVAGKK
ELPQWLSLEEARKQAKDGVMVWDFASDENPDIVLAGCGDYVTQECMASLVLIRELLPR
VKIRFVSVTELSSDGLGSRKFKEKPWLMDEIFTQDKGVVFNYHGYPNTIKKLIFDYKGS
RRFRIKGYEEEGSTTTPFDMGVRNGTSRYHLVIDMAYKLFQQGVIDETMHVSITTDMLQ
RLVDHRNYIKANGVDPIEIENWIWTR (**SEQ ID NO:2**)

Amino acid sequence for a phosphoketolase enzyme from *Lactobacillus rhamnosus LMS2-1*

MSMDTKVKTVDYSSKEYFDKMTAYWRAANYVSVGQLYLKDNPLLERPLKSEDVKPH
PIGHWGTIAGQNFIYTHLNRVINKYDLNMFYIEGPGHGGQVMVSNSYLDGSYSEIYPRV
SQDKEGMKNLFTQFSWPGGVASHASAQTPGSIHEGGELGYALSHATGAILDNPDVIAA
VVTGDGETETGPLAASWFSNTFINPISDGAILPIVHMNGFKISNPTILSRKSDEDLTKYFE
GMGWKPYFVEGDDPTKLNPEMAKVMDAAIEEIKAIQKHARETGDTTMPHWPVIIFRSP
KGWTGPKSWNGEPIEGSFRAHQIPIPVDAEDMEHADSLAGWLKSYHPEELFDENGKLIP
ELAALPPKGDKRMAANPITNGGLDPKPLVLPDYRKYALDNKEHGKQIKQDMIVWSDY
LRDLIKLNPHNFRIFGPDETMSNRLYSLFEVTNRQWLEPIKEPADQYLAPAGRIIDSQLSE
HQSEGFNEGYTLTGRHGLFTSYEAFLRVVDSMLTQHFKWIRKAHEEPWHKAYPSLNVV

STSTSFQQDHNGYTHQDPGILTHMAEKKAEYIREYLPADANSLLAISPKLFSSQNTVNVL
ITSKQPRPQFYSIDEATVLANAGLKRIDWASNDDGVEPDVVIAAAGTEPNMESLAAINLL
HDAFPDLKIRFINVLDLLKLRSPEIDPRGLSDAEFNSYFTTDKPILFAYHGFEGLIRDIFFTR
QNRNVLIHGYREEGDITTPFDMRVLNELDRFHLAKDVIQHVPAYAEKAAAFVQKMDDT
LQYHHDFIRANGEDIPEVQEWTWKSIK **(SEQ ID NO:3)**

Amino acid sequence for a phosphoketolase enzyme from *Lactobacillus crispatus ST1*

MAVDYDSKDYLKSVDAYWRAANYLSVGQLFLMKNPLLKTPLVAEDVKPKPIGHWGTI
APQNFIYAHLNRVLKKYDLNMFYIEGSGHGGQVMVSNSYLDGSYTERYPEITQDEKGM
AKLFKRFSFPGGVASHAAPETPGSIHEGGELGYSLSHGTGAVLDNPDVIAAVEIGDGEAE
TGPLAASWFSDKFINPIKDGAVLPILQINGFKISNPTIVSRMSDQELTEYFRGMGWDPHF
VSVFKGGRFDGEKDPMQVHEEMAKTMDEVIEEIKAIQKHARENNDATLPHWPMIIFQC
PKGWTGPKKDLDGNPIENSFRAHQIPIPVAQGDMEHADMLTDWLESYKPEELFNEDGSP
KEIVTENTAKGDHRMAMNPITNGGIDPKRLNLPDYRKFALKFDKPGSVEAQDMVEWA
KYLDEVAKLNPTTFRGFGPDESKSNRLFQLLDDQKRQWEPEVHEPNDENLAPSGRVIDS
QLSEHQDEGFLEGYVLTGRHGFFATYEAFGRVVDSMLTQHMKWLRKAKEQYWRHDY
PSLNFVATSTVFQQDHNGYTHQDPGILTHLYEKNRPDLVHEYLPSDTNTLLAVGDKAL
QDRECINVLVTSKQPRPQWFSIEEAKKLVDKGLGYIDWASTDKGAKPDVVFASTETEPT
IETLAAIDILHKKFPDLKIRYINVVDVMKLMDPKDNKNGLSTEEFDRLFPKDVPVIFAWH
GYKSMMESIWFARKRYNVHIHCYEENGDITTPFDMRVLNHLDRFDLAKDAVESIDKLK
GKNADFISHMDDLLEKHHQYIRDNGKDMPEVTEWQWSGLK **(SEQ ID NO:4)**

Amino acid sequence for a phosphoketolase enzyme from *Bifidobacterium longum subsp. longum JDM301*

MTSPVIGTPWKKLNAPVSEEALEGVDKYWRVANYLSIGQIYLRSNPLMKEPFTREDVK
HRLVGHWGTTPGLNFLIGHINRFIADHGQNTVIIMGPGHGGPAGTSQSYLDGTYTETFPK
ITKDEAGLQKFFRQFSYPGGIPSHFAPETPGSIHEGGELGYALSHAYGAIMDNPSLFVPAI
VGDGEAETGPLATGWQSNKLVNPRTDGIVLPILHLNGYKIANPTILSRISDEELHEFFHG
MGYEPYEFVAGFDDEDHMSIHRRFAELWETIWDEICDIKAAAQTDNVHRPFYPMLIFRT
PKGWTCPKYIDGKKTEGSWRAHQVPLASARDTEAHFEVLKNWLESYKPEELFDANGA
VKDDVLAFMPKGELRIGANPNANGGVIRDDLKLPNLEDYEVKEVAEYGHGWGQLEAT
RRLGVYTRDIIKNNPRDFRIFGPDETASNRLQASYEVTNKQWDAGYISDEVDEHMHVSG
QVVEQLSEHQMEGFLEAYLLTGRHGIWSSYESFVHVIDSMLNQHAKWLEATVREIPWR
KPIASMNLLVSSHVWRQDHNGFSHQDPGVTSVLLNKCFHNDHVIGIYFATDANMLLAI
AEKCYKSTNKINAIIAGKQPAATWLTLDEARAELEKGAAAWDWASTAKNNDEAEVVL
AAAGDVPTQEIMAASDKLKELGVKFKVVNVADLLSLQSAKENDEALTDEEFADIFTAD
KPVLFAYHSYAHDVRGLIYDRPNHDNFNVHGYEEEGSTTTPYDMVRVNRIDRYELTAE
ALRMIDADKYADKIDELEKFRDEAFQFAVDKGYDHPDYTDWVYSGVNTDKKGAVTAT
AATAGDNE **(SEQ ID NO:5)**

Amino acid sequence for a phosphoketolase enzyme from *Leuconostoc citreum KM20*

MADFDSKEYLELVDKWWRATNYLSAGMIFLKSNPLFSVTNTPIQAEDVKVKPIGHWGT
ISGQTFLYAHANRLINKYDLNMFYIGGPGHGGQVMVTNAYLDGEYTEDYPEITQDLEG
MSRLFKRFSFPGGIGSHMTAQTPGSLHEGGELGYSLSHAFGAVLDNPDQIAFAVVGDGE
AETGPSMTSWHSTKFLNAKNDGAVLPILDLNGFKISNPTIFSRMSDEEITKFFEGLGYSPR

FIENDDIHDYAAYHELAAKVLDQAIEDIQAIQKDARENGKYEDGTIPAWPVIIARLPKG
WGGPTHDEDGNPIENSFRAHQVPLPLAQNKLETLSQFEDWMNSYKPEELFNADGSLKD
ELKAIAPKGDKRMSANPIANGGRRRGEEATDLTLPDWRQFTNDITNENRGHELPKVTQ
NMDMTTLSNYLEEVAKLNPTSFRVFGPDETMSNRLWSLFNTTNRQWMEEVKEPNDQY
VGPEGRIIDSQLSEHQAEGWLEGYTLTGRVGIFASYESFLRVVDTMVTQHFKWLRHASE
QAWRNDYPSLNLIATSTAFQQDHNGYTHQDPGMLTHLAEKKSNFIREYLPADGNSLLA
VQDRAFSERHKVNLIIASKQPRQQWFTADEADELANEGLKIIDWASTAPSGDVDITFASS
GTEPTIETLAALWLINQAFPEVKFRYVNVVELLRLQKKSESHMNDERELSDAEFNKFFQ
ADKPVIFGFHAYEDLIESFFFERKFKGDVYVHGYREDGDITTTYDMRVYSKLDRFHQAK
EAAEILSANSTIDQAAADTFIEKMDATLAKHFEVTRNEGRDIEEFTDWNWSALK (**SEQ ID NO:6**)

Amino acid sequence for a phosphoketolase enzyme from *Bradyrhizobium sp. S23321*

MNNQQQSALSRSDLDLLDRYWRAANYLSVGQIYLLDNPLLREPLRPEHIKPRLLGHWG
TTPGLNFIYAHLNRVIRALDLSVLYVCGPGNGGPGMVANTYLEGSYSEIYPNIARDTDG
LRKLFRQFSFPGGIPSHAAPETPGSIHEGGELGYALVHAYGAAFDNPDLIVACVVGDGE
AETGPLAASWHSNKFLNPVHDGAVLPILHLNGYKIANPTVLGRMRDEEIRDLFRGFGHE
PLFVEGDDPTLMHQAMADAFDVAFARIRSIQQHARDGRKEIERPRWPMIVLRSPKGWT
GPKEVDGLKVEGFWRAHQVPVAGCRENPAHLKILEDWMRSYEPEKLFDASGALIPELQ
ALAPEGNRRMGANPHANGGLLKKELKLPDFRSFALEVPQPGGVTGEATRELGKFLRDV
IRLNAAERNFRIMGPDETASNRLDAVFEETERVWMEPIEPYDVHLAQDGRVMEVLSEH
LCQGWLEGYLLTGRHGFFSCYEAFIHIVDSMFNQHAKWLKVTRHLPWRRPIASLNYLL
TSHVWRQDHNGFSHQDPGFVDLVANKKADIVRIYFPPDANTLLWIADHCLRTYNRINVI
VAGKQPAPQWLSMQDAATHCDAGIGIWSWAGNEDATGEPHVVMACAGDVPTLETLA
AVDLLRKALPDLKIRVVNVVDLMTLQPKEQHPHGLSDRDFDSLFTSDKPVIFAYHGYPH
LIHRLTYNRTNHAGLHVRGFIEEGTTTTPFDMVVLNELDRYHLAIEAIERVPGLAARAA
AVKQQFRDALIEHSHYIREHGEDMPEIRDWVWPGKTG (**SEQ ID NO:7**)

Amino acid sequence for a phosphoketolase enzyme from *Enterococcus faecium E1039*

MDYSSKEYFDKMTAWWRAANYLSVGQLYLKDNPLLRRTLKPEDVKKHPIGHWGTIPG
QNFIYVHLNRVINKYDLNMFYIEGPGHGGQVMVSNAYLDGSYTEIYPEVTEDETGMQK
LFKRFSFPGGIASHAAPETPGSIHEGGELGYSLSHAVGAVLDNPEVISAVVIGDGEAETGP
LAGSWFSNVFINPVIDGAVLPILHLNGAKIANPTILARKSDGELANYFNGLGWEPFFIEG
NDPEKLNPVMAEKMDQAIEKIKSIQKEARLKTATDVVMPKWPVLIVRTPKGWTGEPIE
GTFRAHQVPIPVDQEHMDHADALLRWLKSYEPEKLFDAQGRILEEIREIAPTGDQRMAK
NPITNGGIDPKPLIMPDWKKYTLQFEKPGSIKAEDMTELGKFVREIIEKNPENFRIFGPDE
TKSNRLNQVFKTTNRQWMEKIEPENDEWLSPSGRVIDSQLSEHQDEGFLEGYVLTGRH
GFFASYESFLRVVDSMLTQHFKWMRKSHDLSWRNDYPSLNLIASSTVFQQDHNGYSHQ
DPGILTHLAEKKAEFIREYLPADANTLLAVMDKAFRSSEKINLIISSKHPRAQFYSAEEAA
VLVNEGLKIIDWASTAKEEEPELVIAAAGTESNLEALAAVTLLLEEFPKLKIRFINVVDLL
KLRHPSQDPRGLSDEEFDQYFTKDKPILFAFHGYETLVRTIFFDRHNHHLMIHGYKENG
DITTPFDMRVVNELDRYHLAKDAALKIKGSQAEDFAEKMDQKLQEHQNYIRENGIDLP
EVLDWKWKNLDQ (**SEQ ID NO:8**)

Amino acid sequence for a phosphoketolase enzyme from *Brucella microti CCM 4915*

MPAKGPLTPQQLSLINRYWRAANYLSVGQIYLMKNPLLREPLQPEHIKPRLLGHWGTTP
GLNFIYAHLNRIIQQRNANVIYICGPGHGGPGMVANTYLEGTYSEIYPAISEDEAGMERL
FRQFSFPGGIPSHAAPETPGSIHEGGELGYALVHAYGAAFDNPDLVVACVVGDGEAETG
ALATSWHSNKFLNPARDGAVLPILHLNGYKIANPTVLARLSDDDLDNLFRGYGYEPFFV
EGSEPADMHQKMAATLDTIFQRIQDIKKNADVHSPERPRWPMIILRSPKGWTGPKTVDG
LVVENYWRAHQVPVANCRENDAHRKILEDWMKSYDPSDLFDEKGALKPELRALAPKG
EARMGANPHANGGLLRKELHMPDFRQYAVNVTEPGAIEAQSTKILGDFLRDVMKLNET
EKNFRIFGPDETASNRLGSVLEATNRVWMAETLDMDDHLAADGRVMEVLSEHLCQGW
LEGYLLSGRHGFFSCYEAFIHIIDSMFNQHAKWLQVARELEWRKPISSLNYLLTSHVWR
QDHNGFSHQDPGFVDLVANKSADIVRVYFPPDANTLLWVGDHCLKTWNRVNVIVAGK
QPEPQWLTMAEAEKHCEAGLGIWEWAGTEDGLEPDIVMACAGDVPTMETLAAVDLLR
QSLPHLRIRVVNVVDLMVLQSPHQHPHGISDEEFDRMFTTNRPVIFAYHGYPYLIHRLV
YKRTNHSNFHVRGFIEQGTTTTPFDMTVLNELDRFHLAMEAVERLPLGESVAKPLIDNF
TEKLALHKDYIRQHGEDMPEIRDWKWTWPR (**SEQ ID NO:9**)

Amino acid sequence for a phosphoketolase enzyme from *Lactobacillus salivarius ATCC 11741*

MTDYSSQEYLDKLDAYWRAANYVSVGQLYLKDNPLLRRPLKAEDVKVKPIGHWGTIA
GQNFIYAHLNRVINKYDLNMFYVEGPGHGGQVMVSNSYLDGSYSEIYPEISQDEQGMK
RLFKRFSFPGGVASHAAPETPGSIHEGGELGYSISHSVGAVLDNPDLIVAAVVGDGEAET
GPLAASWQSNKFINPIHDGAVLPILDLNGFKISNPTILSRESDETLTKYFEGMGWHPIFVE
GDDPKLMHPAMAKAMDEAIEEIKAIQKNARENNDPSLPAWPVIIFRAPKGWTGPKEWD
GEPIEKSFRAHQIPIPVDQNDMQHADALVDWLESYKPEELFDENGKLKAEIAEITPKGDK
RMAANPHTNPGKLIREVIKPDFRDFAVDTSVPGKEVAQDMTVLGKYLEKVLSDNRHNY
RVFGPDETMSNRLAPIFDVTKRQWLAEIKEPNDQYLAPSGQVIDSQLSEHQAEGFLEGY
VLTGRHGFFASYESFLRVVDSMLTQHFKWLRKATEQPWRTSIPSLNVIATSTVFQQDHN
GYTHQDPGILGHLADKKPEYIREYLPADANSLLAVFDKTINDRDKINLIVASKHPRQQFY
SAAEAKELVDKGLKIIDWASTDKNAEPDVVIAAAGTEPNLEALAAISILHEKLPDLKIRFI
NVVDILKLRSPKVDPRGLSDDEFDAYFTKDKPVIFAFHGYEGLLRDIFYYRHNHNVAFH
GYRENGDITTPFDMRVLSQMDRFDLVKSVALSLPDADKYGQLVAEMDAKVAKHHQYI
RDEGTDLPEVENWEWKPLD (**SEQ ID NO:10**)

Amino acid sequence for a phosphoketolase enzyme from *Streptococcus agalactiae COH1*

MSEFDTKSYLEKLDAWWRAANYISAAQMYLKDNPLLRRELVENDLKVHPIGHWGTVP
GQNFIYAHLNRAINKYDLDMFYIEGPGHGGQVMVSNSYLDGSYTELNPNIEQTEDGFK
QLCKIFSFPGGIASHAAPETPGSIHEGGELGYALSHATGAILDNPDVIAATVIGDGEGETG
PLMAGWLSNTFINPVNDGAVLPIFYLNGGKIHNPTIFERKTDEELSQFFEGLGWKPIFAD
VVELSEDHAAAHALFAEKLDQAIQEIKTIQSEARQKPAEEAIQAKFPVLVARIPKGWTGP
KAWEGTPIEGGFRAHQVPIPVDAHHMEHVDSLLSWLQSYRPEELFDENGKIVDEIAAISP
KGDRRMSMNPITNAGIVKAMDTADWKKFALDINVPGQIMAQDMIEFGKYAADLVDAN
PDNFRIFGPDETKSNRLQEVFTRTSRQWLGRRKPDYDEALSPAGRVIDSQLSEHQAEGFL
EGYVLTGRHGFFASYESFLRVVDSMVTQHFKWLRKSKTHTTWRKNYPALNLIAASTVF
QQDHNGYTHQDPGILTHLAEKTPEYIREYLPADTNSLLAVMDKAFKAEDKINLIVTSKH
PRPQFYSIAEAEELVAEGYKVIDWASNVSLNQEPDVVFAAAGTEPNLEALAAISILHKAF

PELKIRFVNVLDILKLRHPSQDARGLSDEEFNKVFTTDKPVIFAFHGYEDMIRDIFFSRHN
HNLHTHGYRENGDITTPFDMRVMSELDRFHLAQDAALASLGIKH **(SEQ ID NO:11)**

Amino acid sequence for a phosphoketolase enzyme from *Rhodococcus imtechensis RKJ300*

MTDGRQVGSQDSDGHYSDSDLDLDLRWWAAANYLTVAQIYLQDNALLRAPLRPEHIK
PRLLGHWGTSPGLSMIYALLNRLIRRTDTDCLYVTGPGHGGPALVAATYLEGTYSEVYP
GVSRDAAGIHRLCRQFSTPGGIPSHVSVQTPGSIHEGGELGYALAHAAGAAFDHPNLLV
ACVIGDGEAETGPLSGSWKLPAFLNPERDGAVLPILHVNGAKIAGPTVYGRSSDADVEA
FLGGQGWAPTVVSGDDPRHVFPALHRALTDAHAAISDLQREARAGRRSAAKWPAIVLR
TPKGWTGPRTVDGVLVEGTHRAHQVPLSGVRTDEAHLRQLEEWMRSYGPGELFDSSG
ALVPDLERLAPQGDKRMGSSPYANGGRLRADLPVPPLEKYALAIEKPGTTLHETTRVLG
ELLRDLYAATATPDGGGYFRLFCPDETASNRLGAVFEVTDRCWQLPVTDYDDGLSARG
RVMEVLSEHLCEGWLEGYLLSGRHGLFASYEAFAMVSVSMLVQHTKWLQHAVDLPW
RAPVASLNVLLTSTCWRNDHNGFSHQGPGMIDAVIPLAPDVVRIWLPPDSNTLLSIADH
CLRSTDHVNLIVVDKQPHLQYLTLAEAHAHCAAGASVWEWAGTEGAVGADPDVVLA
AAGDVPTQEILAAAQLLREHTPDLVTRVVNVVDLMGLLTPTEHPHGFDARMFLDLFTA
DTDVVFAFHGYSRAVHELIHGRPAPDRFHVRGFSEQGTTTTPFDMVVLNRMSRYHLVL
EALRRTRREPAGAGELADFCLRQLERHGEYVVAHLEDMPEVRDWTWS **(SEQ ID NO:12)**

Amino acid sequence for a phosphoketolase enzyme from *Burkholderia xenovorans LB400*

MAEASSRPTPPQVLDADTLRNMDRYWRACNYLSAGMIYLRDNPLLREPLKPEHIKNRL
LGHWGSDPGQSFLLVHLNRLIRKLDLNVIYVAGPGHGAPATLAHCYLEGHYSEIYPDRS
EDEAGMQRFFRQFSFPGGIGSHCTPETPGSIHEGGELGYSLSHGYGAAFDNPDLIVTVMI
GDGEAETGPLATSWHSNKFLNPVRDGAVLPVLHLNGYKIANPTILARIPREELEALLTG
YGHKPYFVEGDDPAVMHQQMAATLEQCIGEIRAIQQHARANNDATRPRWPMIVLRSPK
GWTGPKEVDGHKVEGSWRAHQVPVLDPVTNGKSLKLVENWMRSYEPESLFDEAGRL
VEELRELAPKGARRISANPHANGGLLCKTLDMPAFGDYAVAVKKPGGTYTSPTEVLGK
FLCDVMRRNMTNFRVFGPDETASNKLTAIYEASEKTWLAQTEPSDADGGDLAVDGRV
MEMLSEHTLEGWFEGYVLTGRHGLFATYEAFVHVIDSMFNQHAKWLEKAKRDLGWR
QPVPSINLLITSLVWRQDHNGFTHQDPGFLDVVTNKSPDVVRIYLPPDANCLLSVADHC
LRSRDYVNVIVADKQPHLQYLDMDAAVIHCTKGIGIWDWASTDQGVEPDVVIASAGDI
ATMEALAAVQILKERFADLKIRFVNVVDLFRLMPEHAHPHGLSNRDFDSLFTATKPVIF
NFHSYASLVHKLTYNRTNHDNLHVHGYHEKGNINTPLELAIINQVDRFSLAIDVIDRVPK
LRGVGDHAKEWLRGQVIEHLAYAHAEGIDREEIRNWTWKG **(SEQ ID NO:13)**

Amino acid sequence for a phosphoketolase enzyme from *Mycobacterium intracellulare ATCC 13950*

MTHATALSDDELALIDKYWRAANYLSVGQIYLLDNPLLTEPLTIDHVKPRLLGHWGTTP
GLNLVYAHLNRVIRHRDADVIYVTGPGHGGPGLVANAYLEGTYSEVYTGIEEDTEGLR
KLFRQFSFPGGIPSHVAAQTPGSIHEGGELGYALVHAYGAALDNPYLVVACVVGDGEA
ETGPLAASWHSNKFLNPVTDGAVLPILALNGYKIANPTVLARIPHAELESLLRGYGYRPI
TVAGDDPADVHRQLAAALDDAFDDIAAIQSAARGGNGVERPVWPMIVLRTPKGWTGP
KMVDGKKVEGTWRSHQVPLAATRDNPEHRAQLEEWLRSYGPGELFDENGRLRPELRA
LAPSGDRRMSANPHANGGLLLHDLDLPDFRDYAVAVERPAAVTHEATRVLGGFLRDVI

ARNKDRFRLMGPDETASNRLDAVYGSTDKVWLSEIEPDDEHLAPDGRVMEVLSEHLCQ
GWLEGYLLTGRHGLFNCYEAFVHIVDSMLNQHAKWLATSRELPWRRPIASLNYLLSSH
VWRQDHNGASHQDPGFIDLVANKRPELTRVYLPPDGNTLLSVADHCLRSRDYINVIVA
GKQPALAYLDMDEAVAHCTRGLGIWEWASTATDDPDVVLACAGDIPTLETLAAADILR
SELPELAVRVVNVVDLMRLQPDTEHPHGLPDREFDALFTPDRPVIFAYHGYPWLIHRLT
YSRTNHAHMHVRGFKERGTTTTPFDMVMLNDLDRFHLVMDVIDRVDGLASRAAMLR
QRMVDARLAARMYTREHGEDDPKISGWTWGPSD (**SEQ ID NO:14**)

Amino acid sequence for a phosphoketolase enzyme from *Nitrosomonas sp. Is79A3*

MKKNTKLLSPELLHKMDAYWRAANYLSVGQIYLYDNPLLKQPLKLAHIKPRLLGHWG
TTPGLNFIYVHLNRIIKEHDLNVIYITGPGHGGPGLVANTYLEGTYSEVYPNISQDEDGM
QRLFKQFSFPGGIPSHVAPETPGSIHEGGELGYSLSHAFGAAFDNPGLLVACVVGDGEAE
TGPLATSWHSNKFLNPVHDGAVLPILHLNGYKIAGPTVLARIPCDELEALFRGYGYTPYF
IEGDDPLEMHQRMAATLDAVIANIQSIQRDARTHGFTKRPHWPMIILRSPKGWTGPKVV
DGKPTEGTFRSHQVPMGDMSQPGHVKILEKWLKSYRPQELFDETGKLLAELAELAPQG
ARRMGANPHANGGMLLRDLRLPDFRDYAVKVANPGTVSAEATRTQGEFIRDVVKLNA
TNFRVFSPDETASNRWGAVFEVTNRCSTAEIVPGDDHVAPDGRVMEMLSEHQCEGWLE
GYLLTGRHGFFSCYEAFIHIIDSMFNQHAKWLKVANEIPWRRPIASLNYLLSSHVWRQD
HNGFSHQDPGFIDHVINKKAEIIRIYLPPDANTLLSVTDHCLRSRNYVNVIVAGKQPQPQ
WLDMDAAIKHCTAGIGIWEWASNDQGEEPDVVMACAGDAPTIETLAAVELLWKHFPE
LKIRVINVVDLMSLQPQSEHPHGLSDKDFDGLFTKDKPIIFAYHGYPWLIHRLTYRRTNH
DNLHVRGYKEEGTTSTPFDMVVMNDLDRFHLVADVIDRVPQLGSRAAYVKQAIRDKLI
EHKQYINQYGEDMPEIRNWKWKGSSV (**SEQ ID NO:15**)

Amino acid sequence for a phosphoketolase enzyme from *Schizosaccharomyces pombe 972h-*

MATQNDIPNSTPEDLAKQVEIAEKHPDPPAMPSRLPDSLKTLEAKIDTSKITDEEVANVH
RFQRACDYLAASLIFLSNGLYTGGDLEEKDIKTRLLGHWGTCPGLSIVYSHCNRIINKYD
LNMLFVVGPGHGAPAILSALFLEDSLGPFYPRYQFTKEGLNNLINTFSLPGGFPSHVNAE
VPGAIHEGGELGYALSVSYGAVLDRPDLIVTCVVGDGEAETGPTATSWHAHKFLDPAE
SGAVIPVLELNGYKISERTIYGCMDDSELLSLFSGFGYEVAIVNDTPDQNRVMAATMDW
AVERIHDIQHRARVNREEIKPRWPMIILRTPKGKGCPKYLNGKFLEGTFRAHQVPLKLA
RTDTNQRNLLKDWLNSYNCQDFLDEHGLPTKGITEHLPPREKRMGQRHETYNSYLPLK
VPDWKKYGVKKGETTSATSVVGQYLDELLVTNDSTLRIFSPDELESNKLDGALKHSYR
TMQTDPELMAKRGRVTEVLSEHLCQGFMQGYTLTGRTAIFPSYEAFMTIVVSMLVQYS
KFLKMGLETGWHGKFGSLNYVTSSTWARQEHNGFSHQSPRFITTMLSLKPGVSRVYFPP
DANCFLATVARCMKSENTINLMVSSKNPQPAYLSVEEAEHHCKAGASVWKFASTDNG
ENPDVVIAGVGNEIMFEVVKAAEMLQNDIPELRVRVINVTDLMVLSSLHPHGMNPAEF
DSLFTKDRHVHFNYHGYVMDLKALLFDRIQGTRVTMEGYREEGTTTTPFNMMMCNNT
SRYHVARMALQHALHNPTVAVNCNMLCAKYAWKLEEIENYIMENKDDPPEIYAAPVF
KNKTSTL (**SEQ ID NO:16**)

Amino acid sequence for a phosphoketolase enzyme from *Leuconostoc mesenteroides subsp. mesenteroides J18*

MNIDSTDYLNNLDAYWRATNYLSVGQLYLLDNPLLKEKLTAEQVKIHPIGHWGTIPSQ
NFIYAHLNRAINKFNLNMFYIEGPGHGGQVMISNAYLDGSYTEAFPEITQDEAGMQKMF

KRFSFPGGVASHADPKVPGSIHEGGALGYSILHGAGAVLDNPDLIAAVVVGDGEAETAP
LATSWHVNKFLNPKNDGTVLPILNLNGFKIANPTVLSRESDETLTEYFHSLGWHPYFVSS
FDKPIMQVHEEMAKTMDTVFTEIKDIREKAVQQTNEEITRPLWPMIVLRSPKGWTGPKT
WDDNPIENSFRAHQIPIPADQNHPEYIPQLVDWLQSYKPDELFDENGQLTQSIQEVLPKK
ELRMANNSVTNAGKIKPLILPDIDNYLVENNQPGNNLAQDAILLGDYLRDIIKLNPTNFR
GFGPDETASNRFQDIFETTNRQWLLPIKEPNDQFMAPEGRIIDSMLSEHYDEGMLEAYTL
TGRHGFFASYEVFIREVDDMIVQHFKWLNHSHDVSWRKDVPALNIIADSTVFQQDHNG
YSHQDPGVTTMLYEKQPDFIREFFPADANSLVATFEHAAQATQQINYIVASKHPRLQWF
SPTEAKQLVTQGLRVIDWASTDKGEKPDIIISSAGSEPTTESLAAIQILHEHIPSLKIRYINV
LDLFKLRADASYGLSDDEFDAYFTTDTPVLFAFHGYEPMIESIFFKRHNHHLAVHGYRE
VGDITTPFDMRVLNKIDRFNLVKAAINLLPENIRTKQAALVQEMTDKLDLHVAYTRSKG
TDLPEVEDWRWQPLK **(SEQ ID NO:17)**

Amino acid sequence for a phosphoketolase enzyme from *Streptomyces sp. SA3_actG*

MSDASVSAVADALDYLCLAQLYLRENPLLARPLTSAHVKWRPAGHWGVCPPVNRML
AALGPVQASVPDGYELRVLHGAGHAGPSALAHAYLTGRLGRVYPDLIQSPAGLLELVS
GFPRPETGGEITPMIPGHLHTGGQLGAALAIGQGTVLDAPRRLTVALLGDGECETGTTA
ASWLASRALRGTGDHGTVLPVVLLNGMRMGGPSVLSTLSRDELTAYFTGLGHQPVYS
DGLDIAQLRQAIAEAVADARPLGVPGPSSVLVLTLEKGYGAPAGLAATPAVHKTPLHDP
ASVPSEFDLLSEWLASYRPAQLLTPGGRPRPHLLPALPRPRPEPGGLSAPRGCIAASTQV
ADHASGRAFAQVVPDVLRARAAQGPFRVFSPDELASNRIDLTDGQGRTVPWAVEVLSE
ELCHAWAQGYTETGRHALVATYEAFAPITLSLVQQQLKHRSARRHAGLAPLPSLVYLL
TSLGWHNTFTHQNPSLATALLAGGDPSVHVLTPADPARAAAALTFALRKLDRCTLVIA
DKHATVQHPLETLDEELRHGMAIWPHLSAPGPEEPDLILASAGDLPAEVLTTLARRLRD
DRRELRLRYVHIHDLTALAEEDTRSLALGPAAFTHHFGTTAPLVLATSGHPADIHALFG
RRHPGPRLTVLGYRDPGRPVSQTHLRQLCGLDDTSLWHLATTLIDASKEIPAP **(SEQ ID NO:18)**

Amino acid sequence for a phosphoketolase enzyme from *Lactobacillus buchneri ATCC 11577*

MTVDYDSKEYLDLLDKYWRAANYLSVGQLYLRDNPLLKRPLKSDDVKIKPIGHWGTIV
SQNFIYAQLNRAINKYDLNMFYIEGSGHGGQVMVSNSYLDGSYSDIYPNISQDEKGMQ
KLFKQFSFPGGVASHAAPETPGSIHEGGELGYSLSHGTGAILDNPDVIAAVEIGDGESET
GPLAASWFSDKFINPITDGAVLPIINMNGFKISNPTILSRMSDADLTDYFKGMGWEAHFV
EATADTDHAKVEAEFAKTLDTVIEKIKSIQKNARENETPDNVKLPVWPMIIFRSPKGWT
GPKKDLDGNPIEGSFRAHQVPIPVDANDMEHADELVDWLKSYKPEELFDENGTLKPEL
RALAPKGEQRMSVNPITNGGIKPEPLKLPNVRDFEVKFDKRGTEQKQDMIEWSKWLDA
VAKLNPTTFRGFGPDETKSNRLYSLLDDGKRQWMEDIHEPYDEDLANHGRVIDSQLSE
HQAEGWLEGYVLTGRHGFFATYESFGRVVDSMLTQHFKWLRKASEQYWRKQYPSLNF
VDTSTVFQQDHNGYTHQDPGLLTHLAEKKPEFIREYLPADANELLAVGDSAFRTYEKIN
LIVTSKHPRRQWYSMDEAQNLVKNGLGYIDWASTDQGQEPDVVFAAAGSEPNLEALA
AISILNKEFPELKIRFINVVDILKLNSPKKDPRGLSDEEFDNLFTTDKPVIFAWHGFEDMIK
DIFFDRHNHNLYVHGYRENGDITTPFDMRVLNELDRFHLAADAIRHIPAYAVKGGYFIQ
RMNNIVDKHNRYIREVGTDLPEVTSWNWEPLNK **(SEQ ID NO:19)**

Amino acid sequence for a phosphoketolase enzyme from *Streptomyces ghanaensis ATCC 14672*

MPEAPDTRTVLSDEELRTLDAHWRAANYLAAGQIYLLANPLLTEPLRPEHIKPRLLGHW
GTSPGLNLVYTHLNRVIAGRGLDALCIWGPGHGGPSVLANSWLEGSYGETYPDVGRDA
AGMERLFRQFSFPGGVPSHVAPEVPGSVHEGGELGYSLAHAYGAALDHPGLLVACVIG
DGEAETGPLAASWHSNKFLDPVHDGAVLPILHLNGYKIANPTVLARLPEDELDSLLRGY
GHEPIHVSGDDPAAVHRAMAHAMDTALDRIAEVQRAARERDGVTERARTPVIVLRTPKG
WTGPAEVDGKPVEGTWRAHQVPLAGVRDNPEHLRQLEAWLRSYRPEELFDDAGRPVA
DVLACLPEGDRRLGSTPYANGGLLVRELPMPALDDFAVPVDKPGTTLHEPTRILGGLLE
RIMRDTADRRDFRLVGPDETASNRLEAVYDASGKAWQAGTLDVDEHLDRHGRVMEV
LSEHLCQGWLEGYLLTGRHGLFSCYEAFVHIVDSMVNQHIKWLKTSRELPWRAPIASLN
YLLTSHVWRQDHNGFSHQDPGFVDHVLNKSPEVVRVYLPPDANTLLSVADHALRSRD
YVNVVVAGKQPCFDWLSIDEARVHCARGAGIWEWAGTENGGAPDVVLACAGDVPTQ
EVLAAAQLLRRHLPELAVRVVNVVDIARLMPREEHPHGMTDFEYDGLFTADKPVIFAY
HGYPWLIHRLAYRRNGHPNLHVRGYKESGTTTTPFDMVVRNDLDRYRLVMDVIDRVP
GLAVRAAAVRQRMADARTRHHAWIREHGTDLPEVAEWSWNA **(SEQ ID NO:20)**

Amino acid sequence for a phosphoketolase enzyme from *Cyanothece sp. PCC 8802*

MVATPERPTLEQTPLSAEELRQIQAYWRACNYLAVGMIYLRDNPLLKDPLTEDHVKNR
LLGHWGSSPGLSFIYIHLNRLIKKYGLDVIYMAGPGHGAPGILGPVYLEGTYSETYPDKS
EDEEGMKKFFKQFSFPGGIGSHCTPETPGSIHEGGELGYSLSHAYGAALDNPDLIVAAVV
GDGEAETGPLATAWHSNKFINPIRDGAVLPILHLNGYKIANPTILARISHEELEYLFKGYG
YKPYFVEGSDPEVMHQKMAATLETAIAEIKHIQQEARTSGVAKRPIWPMIVLRSPKGWT
GPASVDGKKTEDFWRSHQVPLSGMHGNPAHIKVLEDWLKSYTPEELFDENGTLIPELKE
LAPTGHHRMSANPHANGGLLRKDLKMPDFRNYGVEVAKPGTVEVGNTALLGNFLRDV
MANNMTNFRVFGPDETASNRLNAIYEISKKVWMGEILPEDADGTEITTDGRVMEMLSE
HTLQGWLEGYLLTGRHGFFHTYEAFAHVVDSMFNQHAKWLDICKNEVPWRASVSSLN
ILLSSTVWRQDHNGFSHQDPGYVDLVTNKSADVVRVYFPPDANCLLSVANHCLKSTDY
VNVIVSDKQIHLQYLNMDQAIKHCTKGIGIWDWASNDDCGTEPDHPDVIMASCGDVAT
KEALAATAILREEFPDLKVRFINVVDLFKLQSEIEHPHGLSDRDFDNLFTKDKPIIFNFHG
YPWLIHKLTYRRTNHHNLHVRGYKEKGNINTPLELAINNQIDRFNLVIDVINRVPKLGSA
AAYVYERMKNAIIEHRAYAYEHGIDKPEINNWKWPH **(SEQ ID NO:21)**

Amino acid sequence for a phosphoketolase enzyme from *Neosartorya fischeri NRRL 181*

MTSKGEIESLSAYGVARSTIQGTPLSQDELRKMDAYFRASMYLCLGMLYLRDNPLLKEP
LKVEHLKARLLGHWGSDAGQSFTWIHMNRLIKKYDLDVLFISGPGHGAPGILSQSYLEG
VYTEVYPEKTQDEKGLQRFFKQFSFPGGIGSHATPETPGSIHEGGELGYSISHAFGTVFD
HPNLITLTMVGDGEAETGPLATSWHSNKFLNPITDGAVLPVLHLNGYKINNPTILARISH
EELEMLLKGYGWTPYFVEGSDRESMHQAMAATLEHCVLEIKKIQKQARESNKAFRPL
WPMIVLRSPKGWSAPREIDGKYLEGFWRAHQIPITDVQSKPEHLKVLENWMKAYKPEE
VFDKNGTLIPELKELAPTGTSRMSANPVGNGGLLRRPMDLPDFRDYALTDIEPGVTIRPS
MSNMSKYLRDVVARNMTTFRVFGPDETESNKLAEIYKAGKKVWMAEYFKEDEDGGN
LDMQGRVMEILSEHTCEGWLEGYILSGRHGMLNSYEPFIHVIDSMVNQHCKWIEKCLA
VEWRAKVSSLNILLTATVWRQDHNGFTHQDPGFLDVVANKSPEVVRIYLPPDGNTLLS
TMNHCFRSVNYVNVIVADKQEHVQFLNMEEAIEHCTKGVGIWDWASNDQGCEPDVV

MASCGDVATHEALAATALLREHLPQLKVRFVNVVDLFRLISDINHPHGMPDRQWGAIF
TTDKPIIFNFHSYPWLIHRLTYKRPGQHNLHVRGYKEKGNIDTPFELAVRNQTDRYSLAI
DAIDRIPSLGNTASGVRERLINLQLAAKNKAFDDGIDPDYIRNWTWDYPRKKC (**SEQ ID NO:22**)

Amino acid sequence for a phosphoketolase enzyme from *Enterococcus faecium TX1330*

MDYSSKEYFDKMTAWWRAANYLSVGQIYLKDNPLLRRTLKPEDVKKHPIGHWGTIPG
QNFIYVHLNRVINKYDLNMFYIEGPGHGGQVMVSNAYLDGSYTEIYPEVTEDETGMQK
LFKRFSFPGGIASHAAPETPGSIHEGGELGYSLSHGVGAVLDNPEVISAVVIGDGEAETGP
LAGSWFSNVFINPVTDGAVLPILHLNGAKIANPTILARKSDGELANYFNGLGWEPFFIEG
NDPEKLNPVMAEKMDQAIEKIKSIQKEARLKTAADAMMPKWPVLIVRTPKGWTGPEE
WDGEPIEGTFRAHQVPIPVDQEHMDHADALLRWLKSYEPEKLFDAQGRILEEIREIAPTG
DHRMAKNPITNGGMDPKPLIMPDWKRYTLQFEKPGSVTAEDMTELGKFVREIIEKNPEN
FRIFGPDETKSNRLNQVFKTTNRQWMEKIEPENDEWLSPSGRVIDSQLSEHQDEGFLEG
YVLTGRHGFFASYESFLRVVDSMLTQHFKWMRKSRDLSWRNNYPSLNLIASSTVFQQD
HNGYSHQDPGILTHLAEKKAEFIREYLPADANTLLAVMDKAFRSSEKINLIISSKHPRAQ
FYSAEEAAVLVNEGLKIIDWASTAKEEEPELVIAAAGTESNLEALAAVTLLLEEFPKLKI
RFINVVDLLKLRHPSQDPRGLSDEEFDKYFTKDKPILFAFHGYETLIRTIFFDRHNHHLMI
HGYKENGDITTPFDMRVVNELDRYHLAKDAALKIKGSQAEDFAKKMDQKLQEHQNYI
RENGIDLPEVLDWKWKNLDQ (**SEQ ID NO:23**)

Amino acid sequence for a phosphoketolase enzyme from *Listeria grayi DSM 20601*

MTDYSSPNYLAKVDAWWRAADFISVGQLYLKGNPLLRRPLEKEDLKVHPIGHWGTISG
QNFIYAHLNRVINKYDLNMFYIEGPGHGGQVMVSNSYLDGSYTDTYPTITQDEVGLTKL
YKQFSFPGGIASHAAPETPGSLHEGGELGYALSHATGSILDNPDVIAATVIGDGEAETGP
LSAGWFSNTFINPVNDGAVLPILYLNGAKISNPTILSRKTDKELTSFFQGLGWDPIFVEGE
DPAKVHPLMAEKLDQAIEKIKAIQTEARKEAADKATMPTWPVILFRTPKGWTGPKEWN
NEPIEGSFRAHQVPIPVDQHHFDHVDALENWLQSYRPEELFTEEGSLKEEIKSLAPKNRM
ATNPITNGGIDPQPLRLPSWKDYAVETANKDVITQDMIELGGFVRDIVKENPDNFRIFGP
DETKSNRLNKVFEVTNRQWMSKAEFPRDEWLAPAGRIIDGQLSEHQAEGFLEGYVLTG
RHGFFASYESFLRVVDSMLTQHFKWLRKAKEQTWRNSYPSLNVIATSTVFQQDHNGYT
HQDPGVLTHLAEKKPEFIREYLPADTNSLLAVMNEAFRSEELINLIVSSKHPRPQFYSAEE
AEILVKDGLKIIDWASTVSEAEEPDVVIASAGTEPNLEALAAVTLLNEAFPSLKIRFINIVD
ILKLRHPDIDPRGLTDEEFDRYFTTDKPIIFAFHSYEGMVRDIFFNRHNHNLFIHGYRENG
DITTPFDMRVLSEMDRFHLAKDAAEAVYGEIATSFAAEMDAVLSKHHHFIRENGEDLPE
VENWKWQALKTDLLEV (**SEQ ID NO:24**)

Amino acid sequence for a phosphoketolase enzyme from *Enterococcus casseliflavus EC30*

MKTTYDTPEYYQKMNAWWRAANYLSVGQIYLKDNPLLRRPIEEKDLKVNPIGHWGTI
AGQNFIYTHLNRVINKYDLNMFYIEGPGHGGQVMVANAYLDGSYSEIYPKATQDEAG
MKHLFKTFSFPGGIASHAAPETPGSIHEGGELGYSIAHATGAILDNPDVIAAVVVGDGEA
ETGPLAGSWFSNTFINPVNDGAILPILHLNGAKIANPTILARKSDQDLTKYFEGMGWTPY
FVEGDDPEAVHPQLAQKMDQAIEQIHAIQAEARKGSAEEAAMPHWPVLIVRTPKGWTG
PKVWDGEPIEGGFRAHQVPIPVNAKHMEHVDALTDWLQSYRPEELFDENGRIKAEIQEL
APKGEQRMAVNPITNGGIDPQPLRLPDWQAHAIAIETPGETTAQDMMVFGKFARDIIKE

NPDNFRIFGPDEAKSNRLNHVFEVTDRQWLEPKHPDYDEWLSSVGRVIDSQLSEHQAEG
FLEGYVLTGRHGFFASYESFLRVVDSMITQHFKWLRKAHDLDWRNPYPSLNLIASSTVF
QQDHNGYTHQDPGIMTHIAEKKADFVRVYLPADANSLMAVMAETLASEEKINLVVSSK
HPRPQFYSADEAKVLVKDGLKVIDWASTDEGQEPDIVIAAAGTEPNLEALAAVSLLIEA
FPELKVRFINVVDLLKLRRPEVDPRGLSDEAFEAYFTKDKPIVFAFHGYEGLIRDIFFGRR
NQQLHIHGYRENGDITTPFDMRILSELDRFHLAKDAAEWVYGEKATDFAQKMADTVA
YHHDFIRENGYDIAEVEEWEWKPLR (**SEQ ID NO:25**)

Amino acid sequence for a phosphoketolase enzyme from *Mycoplasma alligatoris A21JP2*

MKKNTFDTQDYLDKVDAWFRAANYLSVGQMYLRNNPLLRSKITSDDVKVYPIGHWGT
IPGQNFAYAHLNRVINKYNLNMFYIEGPGHGGQVMTSNSYLDGSYTELFPHVTQDVAG
MKHLFKYFSFPGGTASHAAPETPGSIHEGGELGYSLSHATGAILDNPNVIAATIVGDGEA
ETGPLAASWFSNSFINPVNDGAVLPILHLNGGKISNPTILCRKSNKELTDYFAGMGWEA
VFVEGSDEKEMHKVMAQKLDYVIEKIQSIQNEARKKPANQATRPIWPMMVLRTPKGW
TGPDSWNKDKIVGSFRAHQVPIPVNSANMEHIDALLDWLKSYKVDNLFDKNGKLVDEI
AQIAPKGDQRMGMNPITNGGLNPKKLVMPRWQDFALKFSKPGELVNQDMVELGTYFA
KMMELNKDNFRLFGPDETKSNRLYNVFKVTKRQWLEPISPILDEALSPEGRVIDSQLSEH
QAEGFLEGYVLTGRHGVFASYESFLRVVDSMLTQHLKWLKKAKDVHWRNDYPSLNVI
ATSTAFQQDHNGYTHQDPGLIGHLADKTPEIIRQYLPADTNTLLAVMDKSLKERNVINH
IIASKQPREQFYSEQEAAELVEKGLKVIDWASTTKGNEEPELVVVAAGTEPNLEALAAV
TILNKEYPSLKIRFVNVVDLMKLRHPSLDPRGLSDKEFDAIFTSNKPIVFAFHGYEGILRD
MFFKRNNHNLITHGYRENGDITTSFDIRQLSHMDRFHISASAAKAVYGNKAQEFEDKMI
QTIDFHTKYIREYGTDIPEVKEWKWADLTRK (**SEQ ID NO:26**)

Amino acid sequence for a phosphoketolase enzyme from *Carnobacterium sp. 17-4*

MKNYDSKDYLKKVDAFWRAANYLSVGQLYLRDNPLLQRPLKSTDVKAHPIGHWGTIS
GQNFIYAHLNRVINKYDLNMFYIEGPGHGGQVMISNAYLDGSYTEIYPDITENKEGMKK
LFKQFSSPGGVASHAAPETPGSIHEGGELGYSLSHATGAILDNPDVIAATVIGDGEAETG
PLAAGWFSNNFINPVNDGAVLPILYLNGGKISNPTILARKSNEDLKKYFEGMGWKPYFV
EGTDPEKVHPVMANTLDVVIEEIRSIQNEARKGKAEDVEMPHWPVMIIRTPKGWTGPKE
WDNKKIEGTFRAHQVPIPVDAEHMEYVNKLVDWLKSYRPEELFTENGKLIDDLKELTP
KGNKRMATNPITNGGINAKALIIPNWKQHAIDTTIPGAVIAQDMDVFGEQARDLIVKNP
NNFRIFGPDETKSNRLDKIFEVTNRQWLESKELTDEWQSSAGRVIDGQLSEHQAEGFLE
GYVLTGRHGFFASYESFLRVVDSMLTQHFKWLRKATDQKWRNNYPSLNVIATSTVFQQ
DHNGYTHQDPGILTHLAEKKPEFIREYLPADANSLMAVMDKTLQEEQLINLIISSKHPRP
QFYSVEEAEILVKDGLKIIDWASTDNDSEPDLVIAAAGTEPNLEALAAMSILHKAFPELKI
RFINIVDILKLRHPDIDSRGLTDEKFDSYFTKEQPIIFAFHGFEGLIRDIFFNRHNHNLRIHG
YRENGDITTPFDMRVLNEMDRFHLAKDAAKAVYGLKANKFMQEMENTVNFHHQYIRE
NGIDIPEVINWKWEKI (**SEQ ID NO:27**)

Amino acid sequence for a phosphoketolase enzyme from *Melissococcus plutonius ATCC 35311*

MEKDKYSSTEYLDKIDKWWRAANYLSIGQLYLKDNPLLKRKIRSEDVKYHPIGHWGTI
AGQNFIYAHLNRIINKYDLNMFYIEGPGHGGQVMVSNSYLDGSYTEIYPAVTEDEAGM
QKLFKRFSFPGGVSSHAAPETPGSIHEGGELGYSLSHGVGAILDNPEVISAVVIGDGESET
GPLATSWFSNTFINPVTDGAVLPILHLNGAKIANPTILGRKSDKELEQYFRGMGWIPYFV

EGNDPNQMHPLMAKTLDQVIEKIHSIQETARKQTAETASIQKWPLIVLRTPKGWTGPKE
WDGKPIEVTFRAHQVPIPIDQDHMEHVDQLVNWLKSYKPEELFDETGRLNSEIRAIAPM
NDKRMAMNPITNGGINPKPLQMPDWREFDLHISKPGELVAQDMLEFGKMVAAIIKKNP
QNFLIFGPDETKSNLLNDAFSVTSRQWLEPIYEPQDEWLAPSGRIIDSQLSEHQDEGILEG
YVLTGRHGFFASYEAFIRIVDSMIAQHIKWMRKAMDLPWRNGYSSLNLIASSTAFQQDH
NGYTHQDPGILSHLAEKEADFIHEYVPADTNSLLAVMDKVLKSQGKVNLVISSKHPRPQ
FYSPEEAQELVNRGLMEIDWASTVAENGTPEIVIVAAGTEPNMEALAAINLINQSFPKLQ
FRFINVVDLLKLRHPAVDSRGISEVEYNHLFTVDSPIIFVCQGYSSLIRSLFYDRKNRPVSI
HSYQENGAITTPFDMRVLNKIDRYHLAKDIALTAYGSRGEDFARAMDTILEKHNQYIRE
TGKDLPEVLNWKWAPLHIYNENIEQD (**SEQ ID NO:28**)

Amino acid sequence for a phosphoketolase enzyme from *Tetragenococcus halophilus NBRC 12172*

MSVNIDSKEYLERMNAWWRAANYISVAQIFLRDNPLLRRPLEKEDIKINPIGHWGTISG
QNFIYVHLNRVINKYGLNMFYIEGPGHGGQVMVSNSYIDGSYSEIYPDVTQDEAGLKKL
FKQFSFPGGMGSHAAPETPGSIHEGGELGYSMSHAVGAVLDNPDVIAATVIGDGEAETG
PLAASWMSNNFINPVNDGAVLPILNLNGAKIANPTVLARKSDKDLQKYFEGLGWKPYF
VEGDNPEKMHPLMAETLDAVINEIQSIQKEARKGSAEDVTMPHWPVIVFRTPKGWEGP
EKWDNEQIAGTFRAHQVPIPIDASHMEYANDLAKWLKSYRPEELFDENGTIIDAIKELSP
KGDNRMSVNPITNGGLDPKALNMPDWHTHAVDTSKRGTDKAQDMSVLGGFIADIMEN
NPKNFRIFGPDETKSNRLNKVFDVTNRQWVEPRELSDEWQSAVGRVIDGQLSEHQAEG
FLEGYTLTGRHGFFASYEAFLRIVDSMLTQHFKWIRKANEKSWRKKYPSLNVISSSTAF
QQDHNGYTHQDPGVITHLAEKKPEYIREYFPADANSLMAVMDKALKDENVINLITSSK
HPRPQFYSVEEAQELVDYGVKKIDWASNDQDSEPDIVFAAAGSEPNLEALAAISILHEQF
PEMKIRFINVVDLLKLRHPDVDPRGLSDEAFDELFTTDKPVIFNFHGYEGLIRDIFFTRHN
RNLSIHGYREDGDITTPFDMRVKNELDRFHLAKDAANTIYAEKAADFIQEMDKTLQYH
HDYIRENGDDISEVQNWEWKDLK (**SEQ ID NO:29**)

Amino acid sequence for a phosphoketolase enzyme from *Melissococcus plutonius DAT561*

MTKYDSKEYLAKVDAFWRAANYISVGQLYLKDNPLLDRPIETTDVKVHPIGHWGTISG
QNFIYAHLNRVINKYDLNMFYVEGPGHGGQVMVSNSYLDGSYTEIYPEITEDKEGLKKL
FKQFSFPGGIASHAAPETPGSIHEGGELGYSISHATGAILDNPDVIAATVVGDGEAETGPL
SAGWFANTFINPVNDGAILPILYLNGGKISNPTILERKSDEELTKYFEGMGWKPYFVEGT
VPDKVHPLMAKILDHIIEEIKDIQKEARKDKAENAKMPHWPVLIMRTPKGWTGPKIWD
DEKIEGTFRAHQVPIPVDAEHMEHIDALVDWLKSYHPEELFDKNGTLKPELKELVPKGD
RRMAKNPITNGGLDPKPLKMNGWEQHAIDTSTPGMVTAQDMIVFGNYVEDLIKANPTN
FRIFGPDETKSNRLNKVFDSTDRQWMEPISNADEWQSSVGRVIDGQLSEHQAEGFLEGY
ILTGRHGFFASYESFLRVVDSMLTQHFKWLRKAKEQSWRKEYPALNIIATSTVFQQDHN
GYTHQDPGILTHLAEKKAEYIREYLPADANCLMAVMDKAFQENEVINLIVSSKHPRPQF
YSVTEAKELVDKGVKVIDWASNDEGQTPDIVIAASGTEPNLEALAAITLLNKEFIDLKIR
FVNVVDILKLRHPSIDPRGLTDEEFDAIFTKDKPIVFAFHGFEGLIRDIFFSRSNHQLFVHG
YREKGDITTPFDMRVLSEMDRFHLAKDVADKVYNEQAADFMNRMDEILAFHHQYIRK
NGIDIPEVVNWKWEDLRKKTICFN (**SEQ ID NO:30**)

Amino acid sequence for a phosphoketolase enzyme from *Mycoplasma arthritidis 158L3-1*

MKKTNYDSNEYFNLIDKWFRAANYLSVGQIYLRNNPLLKTKLVADDVKIYPIGHWGTI
PGQNFIYAHLNRVINKYDLEMFYIEGPGHGGQVMISNSYLDGSYTEIYPEITEDEAGLKT
MFKRFSFPGGTASHAAPETPGSIHEGGELGYALSHATGAILDNPNVIAATVIGDGEAETG
PLAAGWFSNSFINPVNDGAVLPIIHLNGAKISNPTILSRKSNQELENYFSGLGWEPLFVEG
DDPKLMHPLMAKKLDEAIEKIQMIQASARKHKASEATRPVWPMLIVRTPKGWTGPKD
WNGEVVEGSFRAHQVPIPVNALNMTHIDKLEAWLTSYHPEELFDKNGKILEEIRALAPK
GLKRMAVHPITNGGINPRTLKLSSWEKFATKFETPGQIKGQDMIELGKYFAEIITLNKDN
FRIFGPDETKSNRMNAVFNVTKRQWLEKIAPTYDEWMSPEGRVIDSQLSEHQAEGFLEG
YVITGRHGVFASYEAFLRVVDSMLTQHMKWMKKSLELPWRKDFPSLNVIATSTAFQQD
HNGYTHQDPGLLGHLADKRPELIREYLPADTNCLLATMEKALKDRNVINLIVASKQPRE
QFYSVEEASELVQKGYKIINWASNVSKNEEPDVVFAAAGVEPNLEALAAISILNKEFPNL
KIRFVNVLDLLKLKSPKHDPRGISDEEFDQIFTKNKPIIFAFHGYEGLLRDIFFDRHNHNLI
THGYRENGDITTSFDIRQLSHMDRFHIAKDAAIAALGKDGEMFAKKMDSKLQEHTSYV
REYGYDLPEVVNWKWTNLKPIK (**SEQ ID NO:31**)

Amino acid sequence for a phosphoketolase enzyme from *Streptococcus agalactiae NEM316*

MSEFDTKSYLEKLDAWWRAANYISAAQMYLKDNPLLRRELVENDLKVHPIGHWGTVP
GQNFIYAHLNRAINKYDLDMFYIEGPGHGGQVMVSNSYLDGSYTELNPNIEQTEDGFK
QLCKIFSFPGGIASHAAPETPGSIHEGGELGYALSHATGAILDNPDVIAATVIGDGEGETG
PLMAGWLSNTFINPVNDGAVLPIFYLNGGKIHNPTIFERKTDEELSQFFEGLGWKPIFAD
VVELSEDHAAAHALFAEKLDQAIQEIKTIQSEARQKPAEEAIQAKFPVLVARIPKGWTGP
KAWEGTPIEGGFRAHQVPIPVDAHHMEHVDSLLSWLQSYRPEELFDESGKIVDEIAAISP
KGDRRMSMNPITNAGIVKAMDTADWKKFALDINVPGQIMAQDMIEFGKYAADLVDAN
PDNFRIFGPDETKSNRLQEVFTRTSRQWLGRRKPDYDEALSPAGRVIDSQLSEHQAEGFL
EGYVLTGRHGFFASYESFLRVVDSMVTQHFKWLRKSKTHTTWRKNYPALNLIAASTVF
QQDHNGYTHQDPGILTHLAEKTPEYIREYLPADTNSLLAVMDKAFKAEDKINLIVTSKH
PRPQFYSIAEAEELVAEGYKVIDWASNVSLNQEPDVVFAAAGTEPNLEALAAISILHKAF
PELKIRFVNVLDILKLRHPSQDARGLSDEEFDKVFTTDKPVIFAFHSYEDMIRDIFFSRHN
HNLHTHGYRENGDITTPFDMRVMSELDRFHLAQDAALASLGNEAQAFSDEMNQMVAY
HKDYIREHGDDIPEVQNWKWENIK (**SEQ ID NO:32**)

Amino acid sequence for a phosphoketolase enzyme from *Mycoplasma agalactiae PG2*

MKKSHDFDSKEYLNLVDAWWRAANYLSVGQMYLRNNPLLKIPLTSNDVKIYPIGHWG
TVPGQNFIYAHLNRIINKYDLNMFFISGPGHGGQVIASNTYLDGSYTELFPHVTKDIKGM
THLFKYFSFPGGTASHAAPECPGSIHEGGELGYSLSHAAGAVLDNPDVIAATVIGDGESE
TGPLSAGWFINSFINPANDGAVLPILHVNGGKISNPTIWSRRSNEELVSYFTGAGWKPFIV
EGNEPEYMHHEMAKALDASVELIKQYQAEARKNGANKAKRPQWPMIVLKSPKGWTG
PKEWNHEAIEGSFRAHQVPVPVSAEKMQHIDALENWLRSYRPEELFDENAQLKPEIAAI
APKGDRRMGKNPIANGGINPRAINVGDWTKFALDIKQPGKVINQDMVTLGSYLGELSL
LNKDNFRVWGPDEHKSNRLYEMFKVTDRQWLDRIDEKYDEFLSSVGRIIDSQLSEHQA
EGMLEGYVLTGRHGVFASYESFLRVVDSMLTQHMKWVKKALDIPWRNDYPSLNVIAT
SNAFQQDHNGYTHQDPGLIGHLADKRPELIREYLPADTNTLLATMAKALQDRNVINLIIS
SKQPRHQFFSIEEATELVEKGIKIIDWASNIKPNEEPDLVVAASGTESTIESLATITYLRAH
FPELKIRFVNVLDLLKLRHPSIDPRGLSDSEFDSIFTKDKPILFAFHGYEAILRDIFFLRSNH

NIITHGYRENGDITTAFDIRLLSEMDRFHMTANVAKKLAPVVGESKANELVKLMEDKIK
EHRAYIKEYGTDLPEVKEWEWTPYK (**SEQ ID NO:33**)

Amino acid sequence for a phosphoketolase enzyme from *Streptococcus gordonii str. Challis substr. CH1*

MTTDYNSKAYLEKVDAWWRAANYISAAQMYLKDNPLLKRDVVANDLKAHPIGHWG
TVPGQNFIYAHLNRTINKYDLDMFYIEGPGHGGQVMVSNSYLDGSYTELNPNIPQNEEG
FKHLCKIFSFPGGIASHAAPETPGSIHEGGELGYALSHAAGAILDNPDVIAATVIGDGEGE
TGPLMAGWLSNTFINPVNDGAILPIFYLNGGKIHNPTIFERKTDEELTLFFEGLGWKPIFA
DVTAISENHEAAHALFAAKLDEAIEEIKKVQAEARKGSAEEATQAIFPVLVARIPKGWT
GPKSWEGTPIEGGFRAHQVPIPVDAHHMEHVDALLNWLKSYRPEELFDESGKVLPEIAA
IGPKGDRRMAMNPITNAGVIKPMDTADWKKHALKFGTPGEIVAQDMIEFGKYATDLVD
ANPDNFRIFGPDETKSNRLQEVFTRTSRQWLGRMRPEYDEALSPAGRVIDSQLSEHQAE
GMLEGYVLTGRHGFFASYESFLRVVDSMVTQHFKWLRKCKTHTTWRKNYPALNLIAT
STVFQQDHNGYTHQDPGILTHLAEKTPEFIREYLPADTNSLLAVMDKAFKAEDKVNLIV
TSKHPRPQFYSAEEAEELVREGYKVIDWASTVSNNEEPDVVFAAAGTEPNLEALAAVSI
LHKAFPELKIRFVNVVDILKLRHPSVDARGLSDEEFDQVFTTDKPVIFAFHGYEGMIRDIF
FNRHNHNLRVHGYRENGDITTPFDMRVMSELDRFHLAQDAANAALGEDAAVFSAKMD
ETVAYHNAYIRENGDDIPEVQNWKWENINK (**SEQ ID NO:34**)

Amino acid sequence for a phosphoketolase enzyme from *Kingella oralis ATCC 51147*

MQNTQFDTPEYLAKVDAWWRAANYISAAQMYLKDNPLLKKPLTANDVKAHPIGHWG
TVPGQNFIYAHLNRAINKYDVDMFYIEGPGHGGQVMVSNSYLDHSYTDIYPEITQDEAG
LKKLCKIFSFPGGIASHAAPETPGSIHEGGELGYALSHAFGAVLDNPNIIAAAVIGDGEAE
TGPLCAGWFGNTFINPVNDGAVLPILYLNGGKIHNPTILARKTDAELTQYFNGMGWEPI
FVEVSDPAHSHAIMAQKLDEAVERILAIWQDARSRSANDATMPRWPVLVARIPKGWTG
PKTWNGEPIEGGFRAHQVPIPTNSHDMSTADALEAWLRSYRPEELFDDNGRFLDKWREI
SPKGAKRMSVHPITNGGVAPKALVMPDWTKHALKIGTPGSQDAQDMIECGRLMADVIT
ANPDNFRIFGPDETKSNRLNEVFKVTNRQWLGVRDAAYDEWIAPVGRVIDSQLSEHQA
EGFLEGYVLTGRHGFFASYESFLRVVDSMITQHFKWLRKCKTHAPWRKDYPSLNLIATS
TVFQQDHNGYTHQDPGLLTHLAEKKPEFVREYLPADANTLLAVMSEALTSRDRINLIVS
SKHLRPQFYSADEAKELVREGYKIIEWASTCHDGEPDVVIAAAGTEPNMEALAAINVLH
KHYPEMKIRFINVVDILKLRHPSIDPRGLSDEAFDALFTRDKPVVFCFHGYENMVRDIFF
PRHNRNVRIHGYRENGDITTPFDMRVLSEMDRFHVAKDAAQAVYGEKAADFANKMDE
TIQFHRSYIREHGKDIPEVAEWKWQPLAK (**SEQ ID NO:35**)

Amino acid sequence for a phosphoketolase enzyme from *Mycoplasma fermentans M64*

MNKKEFDSKEYLEKVDAWWRAANYLSVGQIYLRNNPLLKHPLTSDDVKVYPIGHWGT
ISGQNFAYAHLNRVINKYDLNMFYIEGPGHGGQVMTSNSYLDGSYTELFPHVTQDEAG
MQHLFKYFSFPGGTASHAAPETPGSIHEGGELGYSISHATGAILDNPDVIAATIVGDGEA
ETGPLATSWFSNSFINPVNDGAVLPILHLNGGKISNPTILSRKSNEELQQYFRGMGWEPH
FVEGDKPEVMHELMAKTLDSVIEEIQSIQTKARKKPADKAKRPVWPMIVLRTPKGWTG
PKSWNKEAIEGSFRAHQVPLPINAENMEHADALEKWLRSYRPEELFDKKGKLVKEIAAI
APKGKRRMGMNPITNGGINPKVMKLGDWRKFALHFDRPGSVVAQDMVELGTYFADL
VKRNPENFRIFGPDETKSNRLYNLFKVTNRQWMERIDSKLDEALSPVGRIIDSQLSEHQA

QGFLEGYVLTGRHGIFASYESFLRVVDSMVTQHMKWLRKAKEINWRKDYPSLNIMATS
TAFQQDHNGYTHQDPGIIGHMADKRPELIREYLPADTNTLLAVMDKAFTERNVINLIVS
SKQPRHQFYSVEEAETLVEKGLDIIDWASTCSRNETPDLVVVASGTEPNLEALATISILN
KEYPSMKIRFVNVVDLLKLRHPKIDPRGLSDEEFDEIFTKDKPVLFAFHGFEGILRDIFFD
RHNHNLIAHGYRENGDITTSFDIRQLSHMDRFHMASDAAAAVFGSSKAKEFMDKMEET
IQFHNKYIREVGTDIPEVKNWKWEGLIK **(SEQ ID NO:36)**

Amino acid sequence for a phosphoketolase enzyme from *Granulicatella adiacens ATCC 49175*

MTQFDTPEYLAKVDAWWRAANYISVAQMYLKDNPLLRRPIQKEDVKLHPIGHWGTIA
GQNFIYAHLNRAINKYDLDMFYIEGPGHGGQVMVSNSYLDGSYTELYPQITQDEAGFK
QLCKIFSFPGGIASHAAPETPGSIHEGGELGYSLSHATGAVLDNPNVIAAAVIGDGEAET
GPLAAGWFSNTFINPVNDGAVLPILYLNGGKIHNPTILARRTDEELTQFFNGLGWDPIFV
EGTDPEKVHPLMAAKLDEAIEKIQAIQKEARAKSAEEATMPHWPVLVVRTPKGWTGPK
EWNHEPIEGGFRAHQVPIPVSGEAMEHVDALVDWLKSYRPEELFDENGKLVEEIAAISP
KGPRRMSMNPITNAGVVKPMEITDWTKHAIDTSKPGAIQKQDMIEFGKFAADLVKANP
DNFRIFGPDETKSNRLNEVFKATNRQWVGRRDESYDEWISPVGRVIDSQLSEHQAEGFL
EGYVLTGRHGFFASYESFLRVVDSMITQHFKWLRKAKTHAPWRKNYPSLNLIATSTVF
QQDHNGYTHQDPGLLTHLAEKKPEFVREYLPADTNSLMAVMAEALSSEDKINLIVSSK
HPRPQFYSVEEAKELVSEGYKVIDWASTVKEGEEPDVVIAAAGTEPNLEALAGISILHKQ
FPELKIRFINVVDILKLRSPKVDPRGLSDEEFDKLFTTDKPVVFCFHGYEGMIRDLFFDRN
NHNVHIHGYRENGDITTPFDMRVLSEMDRFHVAKDAAVAVYGEKASEFAAKMDETVE
FHHSYIREHGEDIPEVVSWQWENVNK **(SEQ ID NO:37)**

Amino acid sequence for a phosphoketolase enzyme from *Mycoplasma hominis ATCC 23114*

MISKIYDDKKYLEKMDKWFRAANYLGVCQMYLRDNPLLKKPLTSNDIKLYPIGHWGT
VPGQNFIYTHLNRVIKKYDLNMFYIEGPGHGGQVMISNSYLDGSYSEIYPEISQDEAGLA
KMFKRFSFPGGTASHAAPETPGSIHEGGELGYSISHGTGAILDNPDVICAAVVGDGEAET
GPLATSWFSNAFINPVNDGAILPILHLNGGKISNPTLLSRKPKEEIKKYFEGLGWNPIFVE
WSEDKSNLDMHELMAKSLDKAIESIKEIQAEARKKPAEEATRPTWPMIVLRTPKGWTG
PKQWNNEAIEGSFRAHQVPIPVSAFKMEKIADLEKWLKSYKPEELFDENGTIIKEIRDLA
PEGLKRMAVNPITNGGIDSKPLKLQDWKKYALKIDYPGEIKAQDMAEMAKFAADIMK
DNPSSFRVFGPDETKSNRMFALFNVTNRQWLEPVSKKYDEWISPAGRIIDSQLSEHQCE
GFLEGYVLTGRHGFFASYEAFLRVVDSMLTQHMKWIKKASELSWRKTYPSLNIIATSNA
FQQDHNGYTHQDPGLLGHLADKRPEIIREYLPADTNSLLAVMNKALTERNVINLIVASK
QPREQFFTVEDAEELLEKGYKVVPWASNISENEEPDIVFASSGVEPNIESLAAISLINQEY
PHLKIRYVYVLDLLKLRSRKIDPRGISDEEFDKVFTKNKPIIFAFHGFEGLLRDIFFTRSNH
NLIAHGYRENGDITTSFDIRQLSEMDRYHIAKDAAEAVYGKDAKAFMNKLDQKLEYHR
NYIDEYGYDMPEVVEWKWKNINKEN **(SEQ ID NO:38)**

Amino acid sequence for a phosphoketolase enzyme from *Mycoplasma crocodyli MP145*

MKKTVYDTELYIEKLDAWFRAANYLSVGQMYLRNNPLLRNKITKDDVKVYPIGHWGT
IPGQNFAYAHLNRVINKYDLNMFYIEGPGHGGQVMTSNSYLDGSYTELFPHVTQDLDG
MKHLFKYFSFPGGTASHAAPETPGSIHEGGELGYSLSHATGAILDNPNVIAATIVGDGES
ETGPLAAGWFSNSFINPVNDGAVLPILHLNGGKISNPTILCRKSNEELTNYFLGMGWEAI
FVEGEDVQKMHKLMATKLDYAIERILSIQKEARKGKAEEATRPLWPMIVLRTPKGWTG

PQKWNSDQIVGSFRAHQVPIPVNSENMTHIDALVDWLKSYNVDNLFDKKGKLVPEIAEI
APVGDRRMGMNPVTNGGLNPRNLALPNWQDFALNLEKPGAKIAQDMVELGSYFAKV
MEMNKDNFRLFGPDETKSNRLFNVFKVTSRQWLEPINPLFDEALSPAGRVIDSQLSEHQ
AEGFLEGYVLTGRHGVFASYESFLRVVDSMLTQHMKWLKKANDVSWRNDYPSLNVIA
TSTAFQQDHNGYTHQDPGLIGHLADKTPELIRQYLPADTNTLLAVMDKSLTERNVINHII
ASKQPREQFYSAKEAAELVEKGLKVIKWASTVEGNDEPDLVVAAAGTEPNLEALAAITI
LNKEFPKLKIRFVNVVDLMKLRHPSIDPRGITDKEFDKIFTKDKPVLFAFHGYEGILRDIF
FKRNNHNLIAHGYRENGDITTSFDIRQLSHMDRFHMAASAAVAALGKKANAFETKMLE
TIDFHTKYIREYGTDIPEVKEWKWNPLVRK (**SEQ ID NO:39**)

Amino acid sequence for a phosphoketolase enzyme from *Neisseria sp. oral taxon 014 str. F0314*

MSAQYDSADYLNKVDAWWRAANYISVAQMYLKDNPLLMRPIQASDVKAHPIGHWGT
IAGQNFIYAHLNRAINKYDLNMFYIEGPGHGGQVMVSNSYLDGSYSEIYPNITQDEAGL
KQLCKIFSFPGGIASHAAPETPGSIHEGGELGYALSHAVGAVLDNPDVIAATVIGDGEAE
TGPLSAGWFSNVFINPVNDGAVLPILYLNGGKIHNPTILARKSDESLRLYFEGLGWDPIF
VEATDYATTHKVMAQKLDEAIEKIKAIQTKARAGKAEEAVMPKWPVLVARLPKGWTG
PKVWNGEPIEGGFRAHQVPIPASSHDMATVDSLVEWLKSYRPEELFDANGTFKAELREI
SPKGDRRMSTNPITNGGINPRPLNTADWKKFALDNSDRGSIMAQDMIEFGKYAAELVK
ANPDNFRIFGPDETKSNRMNEVFKVTNRQWLEPIDKAYDEWMSPAGRVIDSQLSEHQA
EGFLEGYVLTGRHGFFASYESFLRVVDSMATQHFKWLRKCKTHAPWRKSYPSLNLIAT
STVFQQDHNGYTHQDPGMLTHLAEKKPEFIREYLPADANSLLAVMSEVLSSKDKVNLI
VSSKHPRPQFYSAAEAEELVREGYKVIDWASTDKGGEPDVVIAAAATEPNLEALAAITIL
NKQFPELKIRFINVVDILKLRHPKVDPRGLTDEQFDALFTKDKPVIFCFHGYEGMVRDIF
FDRHNHNLRIHGYRENGDITTPFDMRVLSEMDRFHVAKDAALAVYGDKAQDFAKKMD
DTLAFHHSYIRENGEDIPEVRNWKWEALK (**SEQ ID NO:40**)

Amino acid sequence for a phosphoketolase enzyme from *Eremococcus coleocola ACS-139-V-Col8*

MTVDYNSKEYLTLVDKWWRAANYLSVGQMFLRDNPLLQEEVTADHVKLNPIGHWGT
IGGQNFLYAHLNRIINKYNVNMFYIEGPGHGGQVMVTNSYLDGSYTERYPEFTQDIAG
MKKLFKTFSFPGGIGSHAAPETPGSMHEGGELGYALSHATGAILDNPDVIAATVVGDGE
AETGPLAAGWFSNVFINPVSDGAVLPILYLNGGKIANPTILARKSNEDLTKYFEGMGWK
PYIVEGTDPEQVHPIMAKVLDEVIEEIQAIQAEARKGKAEDAKMPHWPMILYRTPKGWT
GPEEVEGKTIQGSFRAHQVPIPVSGRNMEDIDLLINWLKSYGPEELFTENGELVDELKEF
APKGDHRMAMNPLTNGGNPKPLNMPNWKDYALEIGTPGSKDAQDMIEFGGFARDIVK
ENPENFRIFGPDETKSNRLNKVFEVTNRQWLEPISEKFDENMSASGRVIDSQLSEHQNQG
FLEAYVLTGRHGFFASYESFFRTVDSMITQHFKWIRKSAKHSWRKPYQSLNLISASTVFQ
QDHNGYTHQDPGLLTHIGEKHGEYMRAYLPADTNSLLAVMDKAFRSENVINYVVTSK
HPRPQFFTADEAEELVNEGLKVIDWASTVKDNEEPDVVIAAAGTEPNFEAIAAISYLVK
AFPELKIRFVNVVDLFRLRSPEIDPRGLSDDEFDAIFTKDKPVFFAFHSYEGMLKDIFFTR
HNHNLYAHGYRENGEITTPFDMRVLNELDRFHLSAHVADVVYGDKARDYVAEMKGK
VQEHRDYVEEYGADMPEVEDWKWEDIK (**SEQ ID NO:41**)

Amino acid sequence for a phosphoketolase enzyme from *Aerococcus urinae ACS-120-V-Col10a*

MTDFDSKAYLDKVDAWWRAANYLSVGQMYLRDNPLLDREVTADDIKITPIGHWGTIA
GQNFVYAHLNRVINKYDLNMFYIEGPGHGGQVMQANAYLDGTWTEHYPEYPQNKEG
MQKFFKYFSFPGGTGSHATAEIPGSIHEGGELGYSLSHATGAILDNPDVIAATVIGDGESE
TGPLAASWLSNSFINPVTDGAVLPILYLNGGKIANPTILERKSNEDLIKYFQGLGWDPMV
VEGNDPEKVHPLMAKTLDQAIEKIKSIQGEARKGSADEATMGHWPMILYRTPKGWTGP
KAWEGNDIEGSFRAHQVPIPVNAENMEHVDALIDWLKSYRPEELFTEEGQLRPEIAEIAP
KGDQRMASNPITDGGIDPKPLDLPDWRDYALDFETPGERDAQDMIEMGGYAAGVIEKN
PDNFRIFGPDETKSNRLNKVFNVTKRQWLEPIKDNYDEWMSPSGRVIDSQLSEHQMEGF
LEAYTLTGRHGFFASYEAFIRTVDSMITQHFKWMREASEYKWHKPYQSLNLISSSTAFQ
QDHNGYTHQDPGLLTHLAEKKGEFVRAYLPADTNSLLAVMDKALSSENVINYIVTSKH
PRPQFFSVEEAEEFVDKGYKVIDWASTVEEGEEPDVVIAASGTEPTVETIATISYLHEAFP
ELKIRYVNVVDLYRLRHPNIDPRGLSDEEFDAVFTKDKPVFFGFHSFEGLLKDIFFDRHN
HNLYPHGYREEGAITTPFDMRVLNELDRFHFAAHVAEVVYGDKAQDFIDQMNAKVEE
HRAYIVEYGTDMPEVKEWKWQPLEK **(SEQ ID NO:42)**

Amino acid sequence for a phosphoketolase enzyme from *Kingella kingae ATCC 23330*

MTNKTQFDTPEYLGKVDAWWRAANYISVAQMYLKDNPLLKTPLVANDVKAHPIGHW
GTVPGQNFIYAHLNRAINKYDVDMFYIEGPGHGGQVMVSNSYLDGSYTEIYPDITQDTA
GLKKLCKIFSFPGGIASHAAPETPGSIHEGGELGYALSHAFGAVLDNPNVIAAAVIGDGE
AETGPLCAGWFGNTFINPVNDGAVLPILYLNGGKIHNPTILARKTDEELKQYFNGMGWE
PIFVDVNNVDNYHEIMSQKVDEAVEHILSIWQTARTQKAEDATMPHWPVLVARIPKGW
TGPKTWHGEPIEGGFRAHQVPIPASSHDMETAGELEKWLRSYRPEELFDDNGCFLDKW
RDISPKGAKRMSVHPITNGGINPKALVMPDWTQHALEIGVPGSQDAQDMVECGRLMA
DVVTANPNNFRIFGPDETKSNRLNQVFQVTKRQWLGRRDEAYDEWIAPVGRVIDSQLS
EHQAEGFLEGYVLTGRHGFFASYESFFRVVDSMITQHFKWLRKCKTHAAWRNDYPSLN
LIATSTVFQQDHNGYTHQDPGLLTHLAEKKPEFVREYLPADSNTLMAVMSEALTSRDRI
NLIVSSKHLRPQFFNAEEAKELVREGYKVIDWASTCHDGEPDVVIAAAGTEPNMEALA
AISILHKQFPELKIRFINVVDILKLRHPSIDPRGLSDEQFDALFTQEKPVVFCFHGYEGMIR
DLFFPRANHNVRIHGYRENGDITTPFDMRVLSEMDRFHVAKDAAQAVYGDKASEFAK
KMGETVAFHRSYIREHGTDIPEVAEWKWQPLAK **(SEQ ID NO:43)**

Amino acid sequence for a phosphoketolase enzyme from *Streptococcus criceti HS-6*

MNTNFDSSDYLNKVDAWWRAANYISAAQMYLKDNPLLRREVAAEDLKSHPIGHWGT
VPGQNFIYAHLLRSINKYDLDMFYIEGPGHGGQVMVSNSYLDGSYTELNPQISQTEEGL
KQLCKIFSFPGGIASHAAPETPGSIHEGGELGYALSHATGAVLDNPDVIAATVIGDGESET
GPLMAGWLSNTFINPVNDGAVLPIHFLNGGKIHNPTIFERKSDDELKAFFTGLGWKPIFA
DVTAFASDHAAAHKLFAAKLDEAIEEIRNIQAKARKGSADEATMPAWPVIVARIPKGW
TGPKSWKGTPIEGGWRAHQVPIPVDSHHMEHVDALLDWLKSYQPEELFDAEGHLKSEV
AALSPKGNRRMSMNPITNAGVIKPMDTADWKKRAFDIQTPGEIVAQDMIEFGKYAADL
VEANPDNFRIFGPDESKSNRLNEVFTKTNRQWMGRRDPSYDEWLSPAGRVIDSQLSEHQ
AEGFLEGYVLTGRHGFFASYESFLRVVDTMITQHFKWLRKSKTHTTWRKNYPSLNLIAT
STVFQQDHNGYTHQDPGVLTHLSEKTPEYIREYLPADTNSLLAVMDKAFKDEDKINLIV
TSKHPRPQFYSVEEASELVEKGYKVIDWASTVQANEEPDVVFAAAGTEPNLEALAAISIL

HKTFPSLKIRFVNVVDILKLRHPDLDPRGLSDEEFDKVFTKDKPVIFAFHAYEGMIRDIFF
RRHNHNLHVHGYRENGDITTPFDMRVMSELDRFHLAQDAALTTLGEKAQAFSAKMDE
TVAYHKDYIREHGDDIPEVQNWQWENLDE (**SEQ ID NO:44**)

Amino acid sequence for a phosphoketolase enzyme from *Streptococcus criceti HS-6*

MTEFDSKDYLAKVDAWWRAANYISVAQMYLKDNPLLRREVSKEDVKVHPIGHWGTIA
GQNFIYAHLNRVINKFDLNMFYIEGPGHGGQVMVSNSYIDGSYTERYPNITQDEDGLKQ
LCKIFSFPGGIASHAAPETPGSIHEGGELGYALSHATGAILDNPDVIAATVIGDGEAETGP
LNAGWFSNTFINPVNDGAVLPILYLNGGKIHNPTILSRKTDEELTHLFQGLGWEPYFVEG
NDPEVIHSQMAETLDKVIEKIKTIQTQARQKPAEEAQQAQWPVLIVRTPKGWTGPKEW
NGEPIEGGFRAHQVPIPVEAGHMEHIDALTDWLKSYRPEELFDEKGYVKEEIRVISPKGN
RRMSMNPITNAGIVKKLDLADWRKHAIDTSKPGSIMKQDMIEFGKYAADLVKANPDNF
RIFGPDETKSNRLNNVFTATNRQWLAPRDKSYDEWISPVGRVIDSQLSEHQAEGFLEGY
VLTGRHGFFASYESFLRVVDSMITQHFKWLRKSKTHTDWRKNYPSLNLIATSTVFQQD
HNGYTHQDPGLLTHLAEKTPEYVREYLPADSNSLFAVMEYALADEDKVNVIVTSKHPR
PQFYSVAEAQELVKEGYKVIDWASNDHDGEPDIVFAAAGTEPNLEVLAGISLLHKAFPE
VKIRFINVVDILKLRSPKVDPRGLSDEAFNKLFTTDKPIVFAYHGYEGQIRDLFFNRDNH
KVYIHGYRENGDITTPFDMRVMSEMDRFHIAKEAAQAVLGDKAQGFAQEMADKLAYH
TAYIREHGDDIPEVQNWQWETID (**SEQ ID NO:45**)

Amino acid sequence for a phosphoketolase enzyme from *Mycoplasma columbinum SF7*

MSKTNFDSKKYLDKIHAWWRAANYLSVGQMYLKNNPLLQEPLKDEDIKIYPIGHWGTI
PGQNLIYAHLNRVINKYDLNMFYIEGPGHGGQVMISNSYLDGSYTELFPEITQDLAGLN
KMFKRFSFPGGTASHAAPETPGSIHEGGELGYALSHATGAILDNPDVIAATVIGDGEAET
GPLMAGWYSSSFINPVNDGTVLPILHINGGKISNPTILARKTDKEIKQLLAGFGWEAIFVE
ADVFRPEAIHLSMAKAFDKAIEKIQRIQREARANSANHAKRPIWPALVVRTPKGWTCPH
KIDDKVYEGSFRSHQVPLAVSSENTTKKVDLVNWLESYKPRELFNQDGSFKAHYAEIAP
KGNKRMAMNPITNGGINPKNLDLPNWEQFAIDFDKPGAIKAQDMVSAGTWFADVIKR
NPTNFRIFGPDETKSNRLFDVLKTTNRQWLERVDYDLDENIGPAGRVIDSQLSEHQAEG
FLEGYVLTGRHGMFASYESFLRVVDSMLTQHMKWVAKAKKVHWRNDYPSLNVIATST
AFQQDHNGYTHQDPGILGHLADKKPELIREYLPADSNTLLAVLDKAFKERDVINLIVAS
KQPREQWFSPREANILVKNGLKVISWASTCTLEEEPDLVVAAAGTEPTLEALAAISYLNE
KFPTLKIRFVNVVDLLKLRHPSIDPRGLSNYEFDSIFTKDKPILFAFHGYEALIRDIFFLRN
NHNLHIHGYRENGDITTSFDIRLMSEMDRFHMAQTAAKAVLGYDKAKSFVDKMQDKI
DQHNAYIKEHGIDMDEVRYWTWKGLNK (**SEQ ID NO:46**)

Amino acid sequence for a phosphoketolase enzyme from *Burkholderia phytofirmans PsJN*

MAEATAHPTPPQTLDADTLRNMDRYWRACNYLSAGMIYLRDNPLLREPLKPEHIKNRL
LGHWGSDPGQSFLLVHLNRLIKKLDLNVIYVAGPGHGAPATLANCYLEGHYSEIYPDRS
QDVAGMERFFRQFSFPGGIGSHCTPETPGSIHEGGELGYSLSHGYGAAFDNPDLIVAVMI
GDGEAETGPLATSWHSNKFLNPIRDGAVLPVLHLNGYKIANPTILARIPREELEALLTGY
GHKPYFVEGEDPAVMHQQMAATLEQCIGEIRAIQQHARESNDASRPRWPMIVLRSPKG
WTGPKEVDGHKVEGSWRAHQVPVLDPATNSKSLKLVENWLRSYEPETLFDEAGRLVK
ELRELAPEGARRISANPHANGGVLCKTLAMPPFRDYAVAVKKPAGSYTSPTEVLGKFLR
DVMRNNMTNFRVFGPDETSSNKLTAIYEASEKTWLAQTVPSDADGGELAVDGRVMEM

LSEHTLEGWFEGYVLTGRHGLFATYEAFVHVIDSMFNQHAKWLEKAKRDLGWRQPVP
SINLLITSLVWRQDHNGFTHQDPGFLDVVTNKSPDVVRIYLPPDANCLLSVADHCLRSR
DYVNVIVADKQPHLQYLDMDAAVTHCTKGIGIWDWASTDQGVEPDVVMACAGDIPT
MEALAAVQILKEQFADLKIRFVNVVDLFRLMPEHAHPHGLSSRDFDSLFTTDKPVIFNFH
SYASLVHKLTYNRTNHDNLHVHGYHEKGNINTPLELAIINQVDRFSLAIDVIDRVPRLRG
VGDHAKEWLRGQIIEHLAYAHAEGIDKEEIRNWTWKG (**SEQ ID NO:47**)

Amino acid sequence for a phosphoketolase enzyme from *Lactobacillus buchneri NRRL B-30929*

MTVDYDSKEYLELVDKYWRAANYLSVGQLFLRDNPLLKRPLEAKDVKVKPIGHWGTI
VSQNLIYAELNRVINKYDLNMFYIEGSGHGGQVMVSNSYLDGSYSDIYPNISQDEKGMA
KLFKQFSFPGGVASHAAPETPGSIHEGGELGYSLSHGTGAILDNPDVIAAVEIGDGESET
GPLAASWFSDKFINPITDGAVLPIINMNGFKISNPTILSRMSDEDLTSYFKGMGWDPYFV
EATADTDHAKVEEEFAKTLDHVIEEIKSIQKNARENETPDNVKLPNWPMIIFRSPKGWT
GPKKDLDGNPIEGSFRAHQVPIPVAAGSMEHKDLLNDWLKSYKPEELFDENGTVKPEIR
AVAPKGDKRMSVNPITNGGIKPEPLKLPDVRNFEVKFDRGVTQKQDMIEWSNWLEKVA
ELNPTSFRGFGPDETKSNRLYSLLDDSKRQWMEDIHEPFDEDLSNHGRVIDSQLSEHQA
EGWLEGYVLTGRHGFFATYESFGRVVDSMLTQHFKWLRKASEQYWRKQYPSLNFVDT
STVFQQDHNGYTHQDPGMLTHLAEKKPEFIREYLPADANELLAVGDVAFRTYEKINLIV
TSKHPRRQWYTMDEAQNLVKNGLGYIDWASTDQGQEPDVVFAAAGSEPNLEALAAISI
LNKEFPEMKIRFINVVDLLKLRSPKVDPRGLSDEEFDNLFTTDKPVIFAFHGFEDLIKDIFF
DRHNHNLHVHGYRENGDITTPFDMRVLNQLDRFDLAKEAVQDIPAYTVKGGYFIQRM
NDMVDKHNAYIRQEGTDLPEVVDWKWEGLKK (**SEQ ID NO:48**)

Amino acid sequence for a phosphoketolase enzyme from *Bifidobacterium gallicum DSM 20093*

MTSPVIGTPWQKLNRPVSEEAIEGMDKYWRASNYMSIGQIYLRSNPLMKEPFTRDDVK
YRLVGHWGTTPGLNFLLAHINRLIADHQQNTVFIMGPGHGGPAGTAQSYLDGTYTEYY
PNITKDEEGLQKFFRQFSYPGGIPSHFAPETPGSIHEGGELGYALSHAYGAVMNNPSLFV
PCIVGDGEAETGPLATGWQSNKLVNPRTDGIVLPILHLNGYKIANPTILARVSDEELHDF
FRGLGYHPYEFVAGFDNEDHLSIHRRFAELFETIFDEICDIKAAANTDDMTRPFYPMLIFR
TPKGWTCPKFIDGKKTEGSWRAHQVPLASARDTEAHFEVLKNWMASYKPEELFDDKG
AIKDDVVDFMPKGDLRIGANPNANGGVIREELDLPALENYEVKEVKEFGHGWGQLEAT
RKLGEYTRDIIKNNPDSFRIFGPDETASNRLQASYEVTNKQWDNGYLSKDLVDEHMAV
TGQVTEQLSEHQCEGFLEAYLLTGRHGIWSSYESFVHVIDSMLNQHAKWLEATVREIP
WRKPISSMNLLVSSHVWRQDHNGFSHQDPGVTSVLLNKTFNNDHVIGLYFATDANVLL
AIAEKCYKSTNMINAIVAGKQPAATWTTLDEARELVAKGAGEFEWASNVKTNDEAEIV
LASAGDVPTQELMAAADRLNKLGVKFKVVNVVDLIKLQSAKENDQALSDAEFAELFTE
DKPVLFAYHSYAHDVRGLIFDRPNHDNFNVVGYKEQGSTTTPYDMVRVNDIDRYELTA
TALRMIDADKYADEIKKLEDFRIEAYQFAVDNGYDIPDYTDWVWPGVKTDLPGAVSAT
AATAGDNE (**SEQ ID NO:49**)

Amino acid sequence for a phosphoketolase enzyme from *Bifidobacterium dentium Bd1*

MTSPVIGTPWKKLNAPVSEEAIEGVDKYWRAANYLSIGQIYLRSNPLMKEPFTREDVKH
RLVGHWGTTPGLNFLIGHINRLIADHQQNTVIIMGPGHGGPAGTAQSYLDGTYTEYFPNI
TKDEAGLQKFFRQFSYPGGIPSHYAPETPGSIHEGGELGYALSHAYGAVMNNPSLFVPAI

VGDGEAETGPLATGWQSNKLVNPRTDGIVLPILHLNGYKIANPTILSRISDEELHEFFHG
MGYEPYEFVAGFDNEDHLSIHRRFAELFETVFDEICDIKAAAQTDDMTRPFYPMIIFRTP
KGWTCPKFIDGKKTEGSWRSHQVPLASARDTEAHFEVLKNWLESYKPEELFDANGAV
KPEVTAFMPTGELRIGENPNANGGRIREELNLPALEDYEVKEVAEYGHGWGQLEATRR
LGVYTRDIIKNNPDSFRIFGPDETASNRLQAAYDVTNKQWDAGYLSAQVDEHMAVTGQ
VTEQLSEHQMEGFLEAYLLTGRHGIWSSYESFVHVIDSMLNQHAKWLEATVREIPWRK
PISSMNLLVSSHVWRQDHNGFSHQDPGVTSVLLNKCFNNDHVIGIYFPVDSNMLLAVAE
KCYKSTDMINAIIAGKQPAATWLTLDEARAELEKGAAEWEWASTAKSNDEAQIVLASA
GDVPAQEIMAAADKLDAMGIKFKVVNVVDLVKLQSTKENDEAISDADFADLFTEDKPV
LFAYHSYARDVRGLIYDRPNHDNFNVHGYEEQGSTTTPYDMVRVNNIDRYELVAEALR
MIDADKYADKIDELEAFRKEAFQFAVDNGYDHPDYTDWVYSGVNTNKQGAVSATAAT
AGDNE (**SEQ ID NO:50**)

Amino acid sequence for a phosphoketolase enzyme from *Bifidobacterium bifidum IPLA 20015*

MTSPVIGTPWKKLNAPVSEEALEGVDKYWRVANYLSIGQIYLRSNPLMKEPFTREDVK
HRLVGHWGTTPGLNFLIGHINRFIADHGQNTVFIMGPGHGGPAGTSQSYLDGTYTETYP
NITKDEAGLQKFFRQFSYPGGIPSHFAPETPGSIHEGGELGYALSHAYGAIMDNPSLFVPC
IVGDGEAETGPLATGWQSNKLVNPRTDGIVLPILHLNGYKIANPTILSRISDEELHEFFHG
MGYEPYEFVAGFDDEDHMSIHRRFAELFESVWDEICDIKAAANTDNMHRPFYPMIIFRT
PKGWTCPKYIDGKKTEGSWRAHQVPLASARDTEAHFEVLKNWLESYKPEELFDANGA
VKDDVLAFMPKGELRIGANPNANGGVIRKDLVLPALEDYEVKEVKEFGHGWGQLEAT
RRLGVYTRDIIKNNMHDFRIFGPDETASNRLQASYEVTNKQWDAGYISDEVDEHMHVS
GQVVEQLSEHQMEGFLEAYLLTGRHGIWSSYESFVHVIDSMLNQHAKWLEATVREIPW
RKPIASMNLLVSSHVWRQDHNGFSHQDPGVTSVLLNKCFHNDHVIGIYFATDANMLLA
IAEKCYKSTNKINAIIAGKQPAATWLTLDEARAELAKGAAAWDWASTAKTNDEAQVV
LAAAGDVPTQEIMAASDKLKALGIKFKVVNVADLLSLQSAKENDEALTDEEFADIFTAD
KPVLFAYHSYAHDVRGLIYDRPNHDNFNVHGYEEEGSTTTPYDMVRVNELDRYELTAE
ALRMIDADKYADEIQKLEDFRQEAFQFAVDKGYDHPDYTDWVYSGVKTDKKGAVTAT
AATAGDNE (**SEQ ID NO:51**)

Nucleic acid sequence encoding for a phosphoketolase enzyme from *Mycobacterium gilvum Spyr1*

atgaccaccgccaccaccgcagaacgtcgtccgctgagcgatcaggatgttgatcgtctggatcgttggtggcgtgcagcaaattatctga
gcgttggtcagatttatctgctggataatccgctgctgcgtacaccgctgacccgtgaagatgttaaaccgcgtctgctgggtcattggggca
ccacaccgggtctgaattttctgtatgcacatctgaatcgtgcaattgcccagcgtcagcagagcaccatttatgttaccggtccgggtcatgg
tggtcctggtctggttgcaaatgcatatctggatggcacctatagcgaaatttacagcgatattacccaggatgatgaaggtctgcgtcgtctg
tttcgtcagtttagctttccgggtggtattccgagccatgttgcaccggaaactccgggtagcattcatgaaggtggtgaactgggttatgcac
tgagccatgcatatggtgcagcatttgataacccggacctgctggttgccgcagttgttggtgatggtgaagcagaaacaggtccgctggca
accagctggcatagcaacaaatttgtgaatgcagccaaagatggtgccgttctgccgattctgcatctgaacggctataaaatcgcaaatcc
gaccctgctggcacgcattccgaccgatgaactgcgtgcactgatggttggttatggtcatcatccgtatttttcgaagttccggatgacgaa
ggcggtccaggtgtggatcatgcagatgcccatcgtcgttttgcacgtctgttagatgatgttctggatgaaattgccgatatcaaaacccgtg
cacgcgaaggtgatgaaagccgtccggcatggccgatgattgtttttcgtaccccgaaaggttggacgggtccggattatattgatggcaaa
aaaaccaccggtagctggcgtgcccatcaggttccgctgtcaaatgcacgtgataccaaagaacatctggcagttctgagtgattggctga
gcagctatcgtcctgatgagctgtttgatgccgatggtcgcctgctgccggaaattgcagaactggcaccgagcggtcagctgcgtatgag
cgataatgcacatgcaaatggcggtctgctgctgaaagatctgcgtctgccggattttcgtgaatatgcagttgatgttccggcaccgggtgc
aaccgttgccgaagcaacccgtgttctgggtcagtggctgaccgaagttattcgtctgaatccggataactttcgcatttttggtccagatgaa

accgcaagcaatcgtctgcaggcagtttatgatgcaaccgataaacagtggaacgccgaatttttggtgcggaagttgatgaacacctggc
acgtgcaggtcgtgttgttgaaatgctgagtgaacatcagtgtcagggttggctggaaggttacctgctgaccggtcgtcatggtctgtttaat
tgttatgaagcctttatccacatcgtggatagcatgctgaaccagcacgcaaaatggctgaaagttaccaatcatattccgtggcgtcgtccta
ttgcaagcctgaattatcttctgagcagtcatgtttggcgtcaggatcataatggttttagtcatcaggatccgggttttattgatcacgttgtgaat
aaaagcgccaaagttgtgcgtgtgtatctgcctccggatgccaatacactgctgagtacctatgatcattgtctgcgtagccgtcagtatgtta
atgttgttgttagcggtaaacagccgagcccgaactttctgaccatggaacaggccgttgcacattgtacccgtggcctgggtatttgggaat
gggcaggtagcgaagaactgggcacagatccggatgtggttctggcaagtgccggtgatattcctaccctggaagcactggcagcagca
gatattctgcgccagcatctgcctgatctgaaagtgcgttttgttaacgttgtggatctgatgcgcctgcaggatagcaccgaacatccgcatg
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cgtcgtgccggtcatgataatctgcatgttcgtggttataaagaagaaggtacaaccaccaccccgttcgatatggttatgctgaatgatttag
atcgctatcacctggtcatggatgtgattgatcgtgtgccgagcctgggttcaacctgtgcagccttacgccagcagatggcagataaacgt
attgcagctcgcgaatataccgtgcgcatggcgaagatattccggaagttaaagattgggtttggcctgcagcacgtgaaagcggttttgg
tacagccggtgcggatggtgcgagcagcaccggtggtgataatgaa **(SEQ ID NO:52)**

Nucleic acid sequence encoding for a phosphoketolase enzyme from *Shewanella baltica OS185*

atgacccagatccatgaaattaatgccctgaaaaaatacgtgcgtgccaccaattttctggcaaccagccagatttatctgaaacagaatgttc
tgcacaaacgtccgctggcacataccgatatcaaaccgcgtctgctgggtcattggggcacctgtccgggtattaactttgtttatgcaaacat
taaccgcctgatcgtgaaacataatcgcagctttatctatctggttggtccgggtcatggttttccggcagttcaggcaaacctgtttatggaag
gtagcctgagccatttttatccggaaaccattccgtataatgaaaccggcattgaagatatttgcaaaaaattcagcgcagcctatggttatcc
gagccatgcaaatccggaagcaccgggtcagattctggaaggtggtgaactgggttatagcctgtcagttggttggggtgcagttctggata
atccggatctgattgcaaccgttctgattggtgatggtgaagcagaaaccggtcctctggcagcaagctggtatgccaatcgtctggtttcac
cggcaacctcaggtgccgttctgccgattgttcatattaatggctataaaatcagcggtccgacccgtatgggtcgtatgagccatgaagaac
tggatctggaatttcgtggtctgggctattttccgattattgtggataatgaactggaagaggatatttacgtgcagatgaccaatgcaatggat
accgcatatgccatgattaacgatattcagcgtcgtgcacgtagcggtgaagatgttgttaaaccgaaatggcctgttattctgatgcgtaccg
caaaaggttggaccggtgttagcgaatacaaaggcaaaaaacttgaaggcaattgcgaaagccatcaggtgattgtgaataaatgtgcaac
cgataaaggtcatctggatgcactggataactggctggcaagctatcattttcaagaactgtatcagatgaacgacaaaggcgaactgattttt
gatgccgatatctgcagcctgattccgcctaaacagctggcatgtggtcgtcagcatctgacctatggtggcgaagttgttcgtgcactgacc
aatccggacctggaaaaactgagctatggtccggaagttccgcgtggtcatcgtggttatagtatgctgaaaatgggtgaatggatgcgtga
tgcctttaaactgaatcgtgatcagcgtaatctgcgcatttttttctccggatgaaacctatagcaatcagctgcaggcagtttttgaagaaaccg
atcgtgcatggcagtggccgattgaaagctgggatgaggatatgagtcgtgaaggtcgtgttattgaactgctgagcgaaaatctgctgtttg
gtatgctgcatggttataccgttaccggtcgtcatggtatgtttccgacctatgaaagctttagccaggttattagcagcatggccgatcagtatt
gcaaatatgtgtatgcaagccagggtgtgcattttcgtaaaccgctgccgagctgtaatgttgttctgagcagcctgctggaacgtcaggatc
ataatggttattcacatcagaatccgagctttctgggtgccatgttagaaaaacatccgaaaattatcagcgcatatctgcctgcagatgcaaat
agcaccctggtttataccgaacgtgcctatgcagatcgtgataagctgaatattctggttgccggaaaaaaagaactgccgcagtggctgag
cctggaagaagcacgtaaacaggcaaaagatggtgttatggtttgggattttgccagtgatgaaaacccggatattgtgctggcaggttgtg
gtgattatgttacccaagaatgtatggccagcctggtgctgattcgtgaactgttaccgcgtgttaaaattcgttttgttagcgttaccgaactga
gcagtgatggcctgggtagccgtaaattcaaagaaaaaccgtggctgatggatgaaattttcacccaggataaaggcgtggtgtttaactat
catggctatccgaataccatcaaaaagctgatcttcgactataaaggcagccgtcgttttcgcattaaaggctatgaagaagaaggtagtacc
accaccccgtttgatatgggtgttcgtaatggcaccagccgctatcatctggtgatcgatatggcatataaactgtttcagcagggcgtgattg
atgaaacaatgcatgtgagcattaccaccgacatgctgcagcgtctggtggatcatcgtaattacattaaagccaatggtgtggatccgatcg
aaatcgaaaattggatttggacccgt **(SEQ ID NO:53)**

Nucleic acid sequence encoding for a phosphoketolase enzyme from *Lactobacillus rhamnosus LMS2-1*

atgagcatggacaccaaagtgaaaaccgttgattatagcagcaaagaatattttgacaaaatgaccgcatattggcgtgcagcaaattatgtt
agcgttggtcagctgtatctgaaagataatccgctgctggaacgtccgctgaaaagcgaagatgttaaaccgcatccgattggtcattgggg

caccattgcaggtcagaattttatctatacccatctgaatcgcgtgatcaacaaatatgatctgaatatgttctacatcgaaggtccgggtcatg
gtggtcaggttatggttagcaatagctatctggatggtagctatagcgaaatttatccgcgtgttagccaggataaagaaggtatgaaaaacct
gtttacccagtttagctggcctggtggtgttgcaagccatgcaagcgcacagacaccgggtagcattcatgaaggtggtgaactgggttatg
cactgagccatgccaccggtgcaattctggataacccggatgttattgcagcagttgttaccggtgatggtgaaaccgaaaccggtccgctg
gcagcaagctggtttagtaataccttttattaacccgattagcgacggtgccatcctgccgattgttcatatgaatggctttaaaatcagcaaccc
gaccattctgagccgtaaaagtgatgaagatctgaccaaatatttcgaaggcatgggttggaaaccgtattttgttgaaggtgatgatccgac
caaactgaatccggaaatggcaaaagttatggatgcagccattgaagaaattaaagccatccagaaacatgcccgtgaaacaggtgatacc
accatgccgcattggcctgttattatctttcgtagcccgaaaggttggacaggtccgaaaagctggaatggcgaaccgattgaaggtagcttt
cgtgcacatcagattccgattccggttgatgccgaagatatggaacatgcagatagcctggcaggttggctgaaatcatatcatccggaaga
actgtttgatgagaacggtaaactgatccctgaactggcagccctgcctccgaaaggcgataaacgtatggcagccaatccgattaccaat
ggtggcctggatccgaaacctctggttctgccggattatcgtaaatatgccctggataataaagaacacggcaagcagattaaacaggacat
gattgtttggagcgattatctgcgtgatctgattaaactgaacccgcataactttcgtattttcggtccggatgaaaccatgagcaatcgtctgta
tagcctgtttgaagttaccaatcgtcagtggctggaaccgatcaaagaacctgcagatcagtatctggcaccggcaggtcgtattattgatag
ccagctgagcgaacatcagagcgaaggttttaatgaaggttataccctgaccggtcgtcatggtctgtttacaagctatgaagcatttctgcgt
gttgttgatagcatgctgacccagcactttaaatggattcgtaaagcacatgaagaaccgtggcataaagcatatccgagcctgaatgttgtta
gcaccagcaccagttttcagcaggatcataatggttatacacatcaggatccgggtattctgacccatatggcagaaaaaaaaagcggaatat
attcgcgagtatctgccagcagatgccaatagcctgctggcaattagtccgaaactgtttagcagccagaataccgttaatgttctgatcacca
gcaaacagcctcgtccgcagttttatagtattgatgaagccaccgttctggcaaatgcaggtctgaaacgtattgattgggcaagcaatgatg
atggtgttgaaccggatgtggtgattgcagccgcaggcaccgaaccgaatatggaaagtctggctgcaattaatctgctgcatgatgcatttc
cggatctgaaaattcgctttatcaatgtgctggatctgctgaaactgcgttcaccggaaattgatcctcgtggtctgagtgatgcagaatttaac
agctatttcaccaccgataaaccgatcctgtttgcctatcatggttttgaaggtctgattcgcgatattttctttacccgtcagaatcgtaacgtgct
gattcatggttatcgtgaagagggtgatattaccaccccgtttgatatgcgtgttctgaatgaactggatcgttttcatctggccaaagatgtgat
tcagcatgttccggcatatgcggaaaaagcagcagcatttgttcagaaaatggatgataccctgcagtatcaccatgattttattcgtgcaaat
ggtgaggatattccggaagttcaagaatggacctggaaaagcattaaa **(SEQ ID NO:54)**

Nucleic acid sequence encoding for a phosphoketolase enzyme from *Lactobacillus crispatus ST1*

atggccgtggattatgatagcaaagactatctgaaaagcgtggatgcatattggcgtgcagcaaattatctgagcgttggtcagctgtttctga
tgaaaaatccgctgctgaaaacaccgctggttgcagaagatgttaaaccgaaaccgattggtcattggggcaccattgcaccgcagaatttt
atctatgcacatctgaatcgtgttctgaaaaagtacgatctgaatatgttctatatcgaaggtagcggtcatggtggtcaggttatggttagcaat
agttatctggatggtagctataccgaacgctatccggaaattacccaggatgagaaaggtatggcaaaactgtttaaacgctttagctttccgg
gtggtgttgcaagccatgcagcaccggaaacaccgggtagcattcatgaaggtggtgaactgggttatagcctgagccatggcaccggtg
cagttctggataatccggatgttattgcagcagttgaaattggtgatggtgaagcagaaaccggtccgctggcagcaagctggtttagcgat
aaattcattaacccgattaaagatggtgccgttctgccgattctgcagatcaatggctttaaaatcagcaatccgaccattgttagccgtatgag
cgatcaagaactgaccgaatattttcgtggtatgggttgggatccgcattttgttagcgtttttaaaggtggtcgtttcgatggcgaaaaagatc
cgatgcaggttcacgaagaaatggccaaaaccatggatgaagtgatcgaagagattaaggccattcagaaacatgcgcgtgaaaataatg
atgcaaccctgccgcattggccgatgattatctttcagtgtccgaaaggttggacaggtccgaaaaaagatttagatggtaatccgatcgaaa
acagctttcgtgcacatcagattccgattccggttgcacagggtgatatggaacatgcagatatgctgacagattggctggaaagctataaac
cggaagaactgttcaatgaagatggcagcccgaaagaaattgttaccgaaaataccgcaaaaggtgatcatcgtatggccatgaatccgat
taccaatggtggtattgatccgaaacgtctgaatctgccggattatcgtaaatttgccctgaaatttgataaacctggtagcgttgaagcacag
gatatggttgaatgggcaaaatatctggacgaagttgccaaactgaacccgaccacctttcgcggttttggtccggatgaaagcaaaagcaa
tcgtctgtttcagctgctggatgatcagaaacgccagtgggaacctgaagttcatgaaccgaacgatgaaaatctggcaccgagcggtcgt
gttattgatagccagctgagcgaacatcaggatgaaggttttctggaaggttatgttctgaccggtcgtcatggtttttttgcaacctatgaagc
atttggtcgtgtggtggatagcatgctgacccagcatatgaaatggctgcgtaaagccaaagaacagtactggcgtcacgattatccgagcc
tgaattttgttgcgaccagcaccgtttttcagcaggatcataatggttatacccaccaggatccgggtattctgacccacctgtatgaaaaaaat
cgtccggatctggtgcatgaatatctgccgagcgataccaataccctgctggcagttggtgataaagcactgcaggatcgtgaatgtattaat
gttctggttaccagcaaacagcctcgtccgcagtggtttagtattgaagaagcaaaaaaactggtcgataaaggcctgggctatattgattgg
gcaagcacagataaaggtgcaaaaccggatgtggtttttgccagtaccgaaacagaaccgacaattgaaaccctggcagccattgatattct

gcataagaaatttccggacctgaagatccgttatatcaatgttgttgacgtgatgaaactgatggatccgaaggataacaaaaatggtctgag
cacggaagaatttgatcgcctgtttccgaaagatgttccggttatttttgcctggcatggctataaaagcatgatggaaagtatttggtttgcccg
taaacgctataacgtgcatattcactgctatgaagaaaacggtgatattaccaccccgtttgatatgcgtgtgctgaatcatctggatcgttttga
tctggcaaaagatgccgttgaaagcatcgataaactgaaaggcaaaaacgccgattttatcagccatatggatgacctgctggaaaaacatc
atcagtatattcgcgataacggcaaagatatgccggaagttacagaatggcaatggtcaggcctgaaa **(SEQ ID NO:55)**

Nucleic acid sequence encoding for a phosphoketolase enzyme from *Leuconostoc citreum KM20*

atggccgatttcgacagcaaagagtatctggaactggttgataaatggtggcgtgcaaccaattatctgagcgcaggtatgatttttctgaaaa
gcaatccgctgtttagcgttaccaataccccgattcaggcagaagatgttaaagttaaaccgattggtcattggggcaccattagcggtcaga
cctttctgtatgcacatgcaaatcgtctgatcaacaaatacgatctgaatatgttctatattggcggtccgggtcatggtggtcaggttatggtga
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ccgggtggtattggtagccatatgaccgcacagacaccgggtagcctgcatgaaggtggtgaactgggttatagcctgagccatgcatttg
gtgcagttctggataatccggatcagattgcatttgcagttgttggtgatggcgaagcagaaaccggtccgagcatgaccagctggcatagc
accaaatttctgaatgcaaaaaatgatggtgccgtgctgccgattctggatctgaacggctttaaaatcagtaacccgaccatttttagccgtat
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aactggcagcaaaagtgctggatcaggcaattgaagatattcaggccattcagaaagatgcccgtgaaaatggtaaatatgaagatggtac
aattccggcatggcctgttattattgcacgtctgccgaaaggttggggtggtccgacccatgatgaggatggtaatccgattgaaaatagcttt
cgtgcacatcaggttccgctgccgctggcacagaataaactggaaaccctgagtcagtttgaagattggatgaatagctacaaaccggaag
aactgtttaatgcagatggcagcctgaaagatgaactgaaagcaattgcaccgaaaggcgataaacgtatgagcgcaaacccgattgcaa
atggcggtcgtcgtcgtggtgaagaagcaaccgatctgaccctgccggattggcgtcagtttaccaatgatataaccaatgaaaaccgtggt
cacgaactgcctaaagttacccagaatatggatatgaccaccctgagcaattacctggaagaagttgcaaaactgaatccgaccagttttcgt
gtttttggtccggatgaaaccatgagcaatcgcctgtggtcactgttcaataccaccaatcgtcagtggatggaagaggtgaaagaaccgaa
tgatcagtatgtgggtccggaaggtcgtattattgatagccagctgagcgaacatcaggcggaaggttggctggaaggctataccctgacc
ggtcgtgttggtatttttgcaagctatgaaagctttctgcgtgttgttgataccatggtgacacagcactttaaatggctgcgtcatgcaagcga
acaggcatggcgtaatgattatcctagcctgaatctgattgcaaccagcaccgcatttcagcaggatcataatggttatacccatcaggatcc
gggtatgctgacccatctggcagagaaaaaaagcaactttatccgtgaatatctgcctgccgatggcaatagcctgctggcagttcaggatc
gtgcatttagcgaacgtcataaagtgaacctgattatcgcaagcaaacagcctcgtcagcagtggtttaccgcagatgaagcagatgagctg
gcaaatgaaggcctgaaaattatcgattgggcaagtaccgcaccgagcggtgatgttgatattacctttgccagcagcggcaccgaaccga
caattgaaacgctggcagccctgtggctgattaatcaagcatttccggaagtgaaattccgctatgttaatgttgtggaactgctgcgcctgca
gaaaaaatcagaaagtcatatgaatgatgagcgcgaactgagtgatgcagagtttaacaaatttttccaggccgataaaccggtgatctttgg
ttttcatgcatatgaggatctgatcgagagctttttttttcgagcgtaaattcaaaggtgatgtgtatgtgcatggttatcgcgaagatggcgatatt
acaaccacctatgatatgcgtgtttacagcaaactggatcgttttcatcaggccaaagaagcagcagaaattctgtcagcaaatagcacaatt
gaccaggcagcagccgatacctttatcgaaaaaatggatgcaaccctggccaaacattttgaagtgacccgtaatgaaggtcgcgatattg
aagaatttacggattggaattggagcgcactgaaa **(SEQ ID NO:56)**

Nucleic acid sequence encoding for a phosphoketolase enzyme from *Bradyrhizobium sp. S23321*

atgaacaatcagcagcagagcgcactgagccgtagcgatctggatctgctggatcgttattggcgtgcagcaaattatctgagcgttggtca
gatttacctgctggacaatccgctgctgcgtgaaccgctgcgtccggaacacattaaaccgcgtctgctgggtcattggggcaccacaccg
ggtctgaattttatctatgcacatctgaatcgtgttatccgtgcactggacctgagcgtgctgtatgtttgtggtccgggtaatggtggtcctggc
atggttgcaaatacctatctggaaggtagctatagcgaaatctatccgaatattgcacgtgataccgatggtctgcgtaaactgtttcgtcagttt
agctttccgggtggtattccgagccatgcagcaccggaaactccgggtagcattcatgaaggtggtgaactgggttatgcactggttcatgc
atatggtgcagcatttgataatccggatctgattgttgcatgtgttgttggtgatggtgaagcagaaaccggtccgctggcagcaagctggca
tagcaacaaatttctgaatccggttcatgatggtgccgttctgccgattctgcatctgaacggctataaaatcgcaaatccgaccgttctgggtc
gtatgcgtgatgaagaaattcgtgatttatttcgcggttttggtcatgaacctctgtttgttgaaggtgatgatccgaccctgatgcaccaggca
atggcagatgcctttgatgttgcatttgcacgtattcgtagcatccagcagcatgcccgtgatggtcgtaaagaaattgaacgtccgcgttggc
cgatgattgttctgcgtagcccgaaaggttggacaggtccgaaagaagttgacggtctgaaagtggaaggtttctggcgtgcccatcaggtt

ccggttgcaggttgtcgtgaaaatcctgcccatctgaaaattctggaagattggatgcgtagctatgaaccggaaaaactgttcgatgcaagc
ggtgcactgattccggaactgcaggccctggctccggaaggtaatcgtcgtatgggtgccaatccgcatgcaaatggcggtctgctgaaaa
aagaactgaaactgccggattttcgtagctttgccctggaagttccgcagcctggtggtgttaccggtgaagccacacgcgaactgggcaa
attcctgcgtgacgttattcgtctgaatgcagcagaacgtaattttcgcattatgggtccggatgaaaccgcaagcaatcgtctggatgccgttt
ttgaagaaaccgaacgtgtttggatggaaccgattgaaccgtatgatgttcatctggcacaggatggtcgcgttatggaagtgctgagcgaa
catctgtgtcagggttggctggaaggctatctgctgaccggtcgtcatggtttttttagctgttatgaagcctttatccacatcgtggatagcatg
tttaatcagcacgcaaaatggctgaaagttacccgtcatctgccgtggcgtcgtccgattgcaagcctgaattatcttctgaccagccatgtttg
gcgtcaggatcataatggttttagtcatcaggatcctggttttgttgatctggttgccaacaaaaaagcggatattgtgcgtatctattttccgcct
gatgccaataccctgctgtggattgcagatcattgcctgcgtacctataatcgcattaatgttattgtggcaggtaaacagcctgcaccgcagt
ggctgagcatgcaggatgcagcaacccattgtgatgcaggtattggtatttggagctgggctggtaatgaagatgcaacaggcgaaccgc
atgttgttatggcatgtgccggtgatgtgccgacactggaaaccctggcagccgttgacctgctgcgcaaagcactgcctgatctgaagatt
cgtgttgttaatgttgtagatctgatgacactgcagcctaaagaacagcatcctcatggtctgagcgatcgcgattttgatagtctgtttaccag
cgataaaccggtgatttttgcctatcatggttatccgcacctgattcatcgtctgacatataatcgtaccaatcatgcaggtctgcatgtgcgtgg
ttttattgaagaaggtacaaccaccacccccgtttgatatggttgttctgaatgaactggatcgctatcacctggcaattgaagccattgaacgcg
ttccaggtctggcagcgcgtgccgcagcggttaaacagcagtttcgtgatgccctgattgaacatagccattatattcgtgaacacggtgaa
gatatgccggaaatccgcgattgggtttggcctggtaaaaccggt **(SEQ ID NO:57)**

Nucleic acid sequence encoding for a phosphoketolase enzyme from *Brucella microti CCM 4915*

atgcctgcaaaaggtccgctgacaccgcagcagctgagcctgattaatcgttattggcgtgcagcaaattatctgagcgttggtcagatttac
ctgatgaaaaatccgctgctgcgtgaaccgctgcagccggaacacattaaaccgcgtctgctgggtcattggggcaccacaccgggtctg
aattttatctatgcacatctgaatcgcattatccagcagcgtaatgccaatgtgatttatatctgtggtccgggtcatggtggccctggtatggtt
gcaaatacctatctggaaggcacctatagcgaaatttatccggcaattagcgaagatgaagcaggtatggaacgtctgtttcgtcagtttagct
ttccgggtggtattccgagccatgcagcaccggaaactccgggtagcattcatgaaggtggtgaactgggttatgcactggttcatgcatat
ggtgcagcatttgataatccggatctggttgttgcatgtgttgttggtgatggtgaagcagaaaccggtgcactggcaaccagctggcatagc
aacaaatttctgaatccggcacgtgatggcgcagttctgccgattctgcatctgaacggctataaaatcgcaaatccgaccgttctggcacgt
ctgagtgatgatgatctggataacctgtttcgcggttatggttatgaaccgttttttgttgaaggtagcgaaccggcagatatgcatcagaaaat
ggcagcaaccctggataccatttttcagcgtattcaggacatcaaaaaaaacgccgatgttcatagtccggaacgtccgcgttggccgatga
ttattctgcgtagcccgaaaggttggaccggtccgaaaaccgttgatggtctggtggttgaaaattactggcgtgcccatcaggttccggttg
ccaattgtcgtgaaaatgatgcccatcgtaaaatcctggaagattggatgaaaagctatgatccgagcgacctgtttgatgagaaaggtgcc
ctgaaaccggaactgcgtgccctggcaccgaaaggcgaagcccgtatgggtgccaatccgcatgcgaatggtggtctgctgcgcaaaga
actgcacatgccggattttcgccagtatgcagttaatgttaccgaaccgggtgcaattgaagcacagagcaccaaaattctgggtgatttcct
gcgtgatgtgatgaaactgaatgaaaccgaaaaaaacttccgcatttttggtccggatgaaacagcaagcaatcgtctgggtagcgttctgg
aagcgaccaatcgtgtttggatggccgaaacactggatatggatgatcacctggcagcagatggtcgtgttatggaagttctgagcgaacat
ctgtgtcagggttggctggaaggttatctgctgagcggtcgtcatggtttttttagctgttatgaagccttcatccacatcatcgatagcatgttta
atcagcatgcaaaatggctgcaggttgcacgcgaactggaatggcgtaaaccgattagcagcctgaattacctgctgaccagccatgtttg
gcgtcaggatcataatggttttagtcatcaggatcctggttttgtagatctggtggcaaataaaagcgcagatattgtgcgtgtttatttccgcct
gatgccaataccctgctgtgggtgggtgatcattgcctgaaaacctggaatcgtgtgaatgttattgttgcaggtaaacagccagaaccgca
gtggctgaccatggcggaagccgaaaaacattgtgaagccggtctgggcatttgggaatgggcaggtacagaagatggcctggaaccg
gatattgttatggcatgtgccggtgatgttccgaccatggaaacgctggcagccgtggatttactgcgtcagagcctgccgcatctgcgtatt
cgtgttgttaatgtggttgatctgatggttctgcagagtccgcatcagcatcctcatggtattagtgatgaagaatttgatcgtatgttcaccaca
aatcgtccggtgatttttgcctatcatggttatccgtatctgattcaccgtctggtttataaacgtaccaatcacagcaattttcacgtgcgtggtttt
attgaacagggtacaaccaccacccccgtttgatatgaccgtgctgaatgagctggatcgttttcatctggcaatggaagcagttgaacgcctg
ccactgggtgaaagcgttgcaaaaccgctgattgataactttacagaaaaactggcactgcacaaagattatattcgtcagcatggcgaaga
tatgccggaaattcgtgattggaaatggacctggcctcgt **(SEQ ID NO:58)**

Nucleic acid sequence encoding for a phosphoketolase enzyme from *Lactobacillus salivarius ATCC 11741*

atgaccgattatagcagccaagaatacctggataaactggatgcatattggcgtgcagcaaattatgttagcgttggtcagctgtatctgaaa
gataatccgctgctgcgtcgtccgctgaaagcagaagatgttaaagttaaaccgattggtcattggggcaccattgcaggtcagaattttatct
atgcacatctgaatcgcgtgatcaacaaatatgatctgaacatgttctatgtggaaggtccgggtcatggtggtcaggttatggttagcaatag
ctatctggatggtagctatagcgaaatctatccggaaattagccaggatgaacagggtatgaaacgtctgtttaaacgttttagctttccgggt
ggtgttgcaagccatgcagcaccggaaacaccgggtagcattcatgaaggtggtgaactgggttatagcattagccatagcgtgggtgca
gttctggataacccggatctgattgttgcagcagttgttggtgatggtgaagcagaaaccggtccgctggcagcaagctggcagagcaata
aattcattaatccgattcatgatggcgcagtgctgccgattctggatctgaatggctttaaaatcagcaatccgaccattctgagccgtgaaagt
gatgaaaccctgaccaaatatttcgaaggtatgggttggcatccgatctttgttgaaggtgatgatccgaaattaatgcatccggcaatggca
aaagcaatggatgaagcaattgaagagattaaagcgattcagaaaaacgcacgcgaaaataacgatccgagcctgcctgcatggcctgtt
attatctttcgtgcaccgaaaggttggacaggtccgaaagaatgggatggcgaaccgatcgaaaaaagctttcgcgcacatcagattccgat
tccggttgatcagaatgatatgcagcatgcagatgcactggttgattggctggaaagctataaaccggaagaactgtttgatgaaaacggca
aactgaaagccgaaattgcagaaattaccccgaaaggcgataaacgtatggcagccaatccgcataccaatccgggtaaactgattcgcg
aagttatcaaaccggattttcgtgattttgcagttgataccagcgttcctggtaaagaagttgcacaggatatgaccgttctgggtaaatatctg
gaaaaagtgctgagcgataaccgccataattatcgtgtttttggtccggatgaaacgatgagcaatcgtctggcaccgatttttgatgttacca
aacgtcagtggctggccgaaatcaaagaaccgaatgatcagtatttagcaccgagcggtcaggtgattgatagccagctgagtgaacatca
ggcagaaggttttctggaaggttatgttctgaccggtcgtcatggttttttgcaagctatgaaagttttctgcgtgtggttgatagcatgctgac
ccagcactttaaatggctgcgtaaagcaaccgaacagccgtggcgtaccagcattccgagtctgaatgttattgcaaccagcaccgtttttca
gcaggatcataatggttatacccatcaggatcctggtattctgggtcatctggcagataaaaaacctgaatatatccgcgaatatctgcctgcc
gatgcaaatagcctgctggcagtttttgataaaaccattaatgaccgcgacaaaattaacctgattgtggcaagcaaacatccgcgtcagca
gttttatagcgcagcagaagcaaaagaactggtagataaaggcctgaaaattatcgattgggcgagcaccgataaaaatgccgaaccgga
tgtggttattgccgcagcaggcaccgaaccgaacctggaagcactggcagcgattagcattctgcatgaaaaactgccggatcttaaaatc
cgctttattaacgttgtggacattctgaaactgcgtagcccgaaagttgatccgcgtggtctgagtgatgatgaatttgatgcctatttcaccaa
agacaaaccggtgatttttgccttcatggttatgaaggtctgctgcgcgatattttctattatcgccataaccataacgtggcctttcacggctat
cgtgaaaatggtgatattaccaccccgtttgatatgcgtgttctgtcacagatggatcgttttgatctggttaaaagcgttgcactgagtctgcct
gatgccgataaatatggccagctggttgccgaaatggatgcaaaagttgcaaaacatcatcagtatatccgtgatgaaggtacagatctgcc
ggaagttgaaaattgggaatggaaaccgctggat **(SEQ ID NO:59)**

Nucleic acid sequence encoding for a phosphoketolase enzyme from *Rhodococcus imtechensis RKJ300*

atgaccgatggtcgtcaggttggtagccaggatagtgatggtcattatagcgatagcgatctggatctggacctgcgttggtgggcagcagc
aaattatctgaccgttgcacagatttatctgcaggataatgcactgctgcgtgctccgctgcgtccggaacacattaaaccgcgtctgctgggt
cattggggcaccagtccgggtctgagcatgatttatgccctgctgaatcgtctgattcgtcgtaccgataccgattgtctgtatgttaccggtcc
tggtcatggtggtccggcactggttgcagcaacctatctggaaggcacctatagcgaagtttatccgggtgttagccgtgatgcagcaggta
ttcatcgtctgtgtcgtcagtttagcacaccgggtggtattccgagccatgttagcgttcagactccgggtagcattcatgaaggtggtgaact
gggttatgcactggcacatgcagccggtgcagcatttgatcatccgaatctgctggttgcctgtgttattggtgatggtgaagcagaaaccgg
tccgctgagcggtagctggaaactgcctgcatttctgaatccggaacgtgatggcgcagttctgccgattctgcatgttaatggtgcaaaaatt
gcaggtccgaccgtttatggtcgtagctcagatgcagatgttgaagcctttctgggtggtcagggttgggcaccgaccgtggtgagcggtg
atgatccgcgtcatgttttccagcactgcatcgtgcactgacagatgcacatgccgcaattagtgatctgcagcgtgaagcacgtgcaggtc
gtcgtagcgcagcaaaatggcctgcaattgttctgcgtaccccgaaaggttggacaggtccgcgtaccgttgatggtgttctggttgaaggt
acacatcgtgcccatcaggttccgctgtcaggtgttcgcaccgatgaagcacatctgcgtcagctggaagaatggatgcgtagctatggtcc
gggtgagctgtttgatagcagcggtgccctggttcctgatctggaacgtctggcaccgcagggtgataaacgtatgggtagcagcccgtat
gcaaatggtggccgtctgcgtgcagatctgccggttccgcctctggaaaaatatgcgctggcaattgaaaaaccgggtacaaccctgcatg
aaaccacccgtgtgctgggtgaattactgcgtgatctgtatgcagccaccgcaacaccggatggtggtggttattttcgtctgttttgtccggat
gaaaccgcaagcaatcgcctgggtgcagtttttgaagttaccgatcgttgttggcagctgccggtgaccgattatgatgatggtctgagtgca

cgtggtcgtgttatggaagttctgagcgaacatctgtgtgaaggttggctggaaggttatctgctgagtggtcgccatggtctgtttgcaagct
atgaagcatttgcaatggttagcgtgagcatgctggttcagcataccaaatggctgcagcatgcagttgatctgccttggcgtgcaccggttg
caagcctgaatgtgctgctgaccagcacctgttggcgtaatgatcataatggttttagtcatcagggtccgggaatgattgatgcagttattcc
gctggctccggatgttgttcgtatttggctgccaccggatagcaataccctgctgtcaattgcagatcattgcctgcgtagcaccgatcatgtg
aatctgattgttgttgataaacagccgcatctgcagtatctgacactggccgaagcccatgcacattgtgcagcgggtgccagcgtgtggga
atgggcaggcaccgaaggtgcggttggtgcggatcctgatgttgtgctggcagcggctggtgatgttccgacccaagaaatcctggcagc
cgcacagctgctgcgcgaacatactccggatctggttacccgtgttgttaatgttgtggatctgatgggtctgctgacgccgaccgaacatcc
gcatggttttgatgcacgtatgtttctggatttgtttaccgcagatacggatgtggtttttgcctttcatggttatagccgtgccgttcatgaactga
ttcatggtcgccctgcaccggatcgttttcatgttcgcggttttagcgaacagggtacgaccaccaccccgtttgatatggttgttctgaaccgt
atgagccgttatcatctggtgctggaagcactgcgtcgcacccgtcgtgaacctgcgggtgcaggcgaactggcagatttttgtctgcgcca
gttagaacgccatggcgaatatgttgttgcacacctggaagatatgccggaagttcgtgattggacctggtca **(SEQ ID NO:60)**

Nucleic acid sequence encoding for a phosphoketolase enzyme from *Burkholderia xenovorans LB400*

atggcagaagcaagcagccgtccgacccctccgcaggttctggatgcagataccctgcgtaatatggatcgttattggcgtgcatgtaattat
ctgagcgcaggtatgatttatctgcgtgataatccgctgctgcgtgaaccgctgaaaccggaacacattaaaaaccgtctgctgggtcattgg
ggtagcgatccgggtcagagctttctgctggtgcatctgaatcgtctgattcgtaaactggatctgaacgtgatttatgttgcaggtcctggtca
tggtgcaccggcaaccctggcacattgttatctggaaggtcattatagcgaaatttatccggatcgtagcgaagatgaagccggtatgcagc
gttttttcgtcagtttagctttccgggtggtattggtagccattgtacaccggaaacaccgggtagcattcatgaaggtggtgaactgggttata
gcctgagccatggttatggtgccgcatttgataacccggatctgattgttaccgtgatgattggtgatggtgaagcagaaaccggtccgctgg
caaccagctggcatagcaacaaatttctgaatccggttcgtgatggcgcagttctgccggttctgcacctgaatggctataaaatcgcaaatc
cgaccattctggcacgtattccgcgtgaagaactggaagcactgctgaccggctatggtcataaaccgtatttcgttgaaggtgatgatccg
gcagttatgcatcagcagatggcagccaccctggaacagtgtattggtgaaattcgtgcaattcagcagcatgcacgtgcaaataatgatgc
aacccgtccgcgttggccgatgattgttctgcgtagcccgaaaggttggacaggtccgaaagaagttgacggccataaagtggaaggtag
ctggcgtgcccatcaggttccggtgctggatccggttaccaatggtaaaagcctgaaactggttgaaaattggatgcgtagctatgaaccgg
aaagcctgtttgatgaagcaggtcgtctggttgaggaactgcgcgaactggcaccgaaaggcgcacgtcgtattagcgccaatccgcatg
caaatggtggtctgctgtgtaaaaccctggatatgcctgcatttggtgattatgcagttgcagttaaaaaaccgggtggcacctataccagcc
cgaccgaagttctgggtaaattcctgtgtgatgttatgcgtcgcaatatgaccaattttcgtgtttttggtccggatgaaaccgcaagcaataaa
ctgaccgcaatttatgaagccagcgaaaaaacctggctggcccagaccgaaccgagtgatgccgatggtggcgatctggcagttgatggt
cgtgttatggaaatgctgagcgaacatacactggaaggctggtttgaaggttatgttctgaccggtcgtcatggtctgtttgcaacctatgaag
catttgtgcatgtgatcgatagcatgtttaatcagcacgcaaaatggctggaaaaagcaaaacgtgatctgggttggcgtcagccggttccg
agcattaatctgctgattaccagcctggtgtggcgtcaagatcataatggttttacacatcaggatcctggttttctggacgttgtgaccaataaa
tcaccggatgttgtgcgtatctatctgcctccggatgccaattgtctgctgagtgttgcagatcattgcctgcgtagtcgcgattatgttaatgtta
ttgttgccgataaacagccgcatctgcagtatctggacatggatgccgcagttattcattgtaccaaaggtattggcatctgggattgggcaag
caccgatcagggtgttgaacctgatgttgttattgcaagtgccggtgatattgccaccatggaagccctggcagcagttcagattctgaaaga
acgttttgccgatctgaaaatccgttttgtgaatgttgttgacctgtttcgcctgatgccggaacatgcacatccgcacggtctgagcaatcgtg
attttgatagtctgtttaccgcaaccaaaccggtgatctttaactttcatagctatgcaagcctggttcacaaactgacatataatcgtaccaacc
atgataacctgcatgtgcatggctatcatgaaaaaggcaatattaacacaccgctggaactggccattattaaccaggttgatcgttttagcct
ggcgattgatgtgattgatcgtgttccgaaactgcgtggtgtgggtgatcatgcaaaagaatggctgcgtggccaggttattgaacatctggc
atatgcacatgccgaaggcattgatcgcgaagaaattcgcaattggacctggaaaggt **(SEQ ID NO:61)**

Nucleic acid sequence encoding for a phosphoketolase enzyme from *Mycobacterium intracellulare ATCC 13950*

atgacccatgcaaccgcactgagtgatgatgaactggcactgattgataaatactggcgtgcagcaaattatctgagcgttggtcagatttatc
tgctggataatccgctgctgaccgaaccgctgaccattgatcatgttaaaccgcgtctgctgggtcattggggcaccacaccgggtctgaat
ctggtttatgcacatctgaatcgtgttattcgtcatcgtgatgccgatgttatttatgttaccggtccgggtcatggtggtcctggtctggttgcaa

atgcatatctggaaggcacctatagcgaagtttataccggtattgaagaagataccgaaggtctgcgtaaactgtttcgtcagtttagctttccg
ggtggtattccgagccatgttgcagcacagactccgggtagcattcatgaaggtggtgaactgggttatgccctggttcatgcatatggtgca
gcactggataacccgtatctggttgttgcatgtgttgttggtgatggtgaagcagaaacaggtccgctggcagcaagctggcatagcaacaa
atttctgaatccggtgaccgatggtgccgttctgccgattctggccctgaatggctataaaatcgcaaatccgaccgttctggcacgtattccg
catgcagaactggaaagcctgctgcgtggttatggttatcgtccgattaccgttgccggtgatgatccggcagatgttcatcgtcaactggca
gctgccctggatgatgcctttgatgatattgcagcaattcagagcgcagcacgtggtggtaatggtgttgaacgtccggtttggccgatgatt
gttctgcgtaccccgaaaggttggacgggtccgaaaatggttgatggcaaaaaagttgaaggtacatggcgtagccatcaggttccgttag
cagcaacccgtgataatcctgaacatcgtgcacagctggaagaatggctgcgtagctatggtccaggcgaactgtttgatgaaaatggccg
tctgcgtccggaactgcgtgcactggcaccgagcggtgatcgtcgtatgagcgcaaacccgcatgccaatggtggactgctgctgcacga
tctggatctgccggattttcgtgattatgcagttgcagtggaacgtcctgcagcagttacccatgaagccacccgtgttctgggtggttttctgc
gtgatgtgattgcacgtaataaagatcgttttcgcctgatgggtccggatgaaaccgcaagcaatcgtctggatgcagtttatggtagcaccg
ataaagtttggctgagcgaaattgaaccggatgatgagcatctggctccggatggtcgtgtgatggaagttctgagtgaacatctgtgtcagg
gttggctggaaggttatttactgaccggtcgtcatggtctgtttaattgttatgaagcctttgtgcacatcgtggatagcatgctgaaccagcatg
caaaatggctggcaaccagccgtgaactgccgtggcgtcgtcctattgcaagcctgaattacctgctgagcagccatgtgtggcgtcagga
tcataatggtgcaagtcatcaggatccgggttttattgatctggtggccaataaacgtccagaactgacccgtgtgtatctgccaccggatgg
caataccctgctgtctgttgcagatcattgtctgcgttcacgcgattacattaatgttattgttgcaggtaaacagccagccctggcctatctgga
tatggatgaagccgttgcacattgtacccgtggcctgggtatttgggaatgggcaagcaccgcaaccgatgatcctgatgttgtgctggcat
gtgcaggcgatattccgaccctggaaaccctggcagccgcagatattctgcgcagcgaactgcccgaactggccgttcgtgttgttaatgtt
gttgatctgatgcgtctgcagccggatacagaacatccgcatggcctgcctgatcgtgaatttgatgcactgtttacaccggatcgtccggtg
atttttgcatatcatggctatccgtggctgatccatcgtctgacctatagtcgtaccaatcatgcacatatgcatgtgcgtggctttaaagaacgt
ggtacaaccaccaccccgtttgatatggtaatgctgaatgatctggaccgttttcacttagttatggatgttatcgatcgtgttgatggtctggca
agccgtgccgcaatgctgcgtcagcgcatggtggatgcacgtctggcagcgcgtatgtatacccgtgaacatggcgaagatgatccaaaa
attagcggttggacctggggtccgagcgat **(SEQ ID NO:62)**

Nucleic acid sequence encoding for a phosphoketolase enzyme from *Nitrosomonas sp. Is79A3*

atgaaaaagaataccaagctgctgagtccggaactgctgcacaaaatggatgcatattggcgtgcagcaaattatctgagcgttggtcagat
ttatctgtatgataatccgctgctgaaacagccgctgaaactggcacatatcaaaccgcgtctgctgggtcattggggcaccacaccgggtc
tgaattttatctatgttcatctgaaccgcattatcaaagagcacgatctgaacgttatctatattaccggtccgggtcatggtggtcctggtctggt
tgcaaatacctatctggaaggcacctatagcgaagtgtatccgaatattagccaggatgaagatggtatgcagcgtctgttcaaacagtttag
ctttccgggtggtattccgagccatgttgcaccggaaactccgggtagcattcatgaaggtggtgaactgggttatagcctgagccatgcatt
tggtgcagcatttgataaccctggcctgctggttgcctgtgttgttggtgatggtgaagcagaaacaggtccgctggcaaccagctggcata
gcaacaaatttctgaatccggttcatgatggtgcagttctgccgattctgcatctgaatggctataaaatcgcaggtccgaccgttctggcacg
tattccgtgtgatgaactggaagcactgtttcgtggttatggttataccccgtattttatcgaaggtgatgatcctctggaaatgcatcagcgtat
ggcagcaaccctggatgcagttattgccaatattcagagcattcagcgtgatgcacgtacccatggttttaccaaacgtccgcattggccgat
gattattctgcgtagcccgaaaggttggacgggtccgaaagttgttgatggtaaaccgaccgaaggtacatttcgtagccatcaggttccgat
gggtgatatgagccagcctggtcatgttaaaattctggaaaaatggctgaaaagctatcgtccgcaagaactgtttgatgaaaccggtaaact
gctggcagaactggccgagctggcaccgcagggtgcacgtcgtatgggtgcaaatccgcatgcaaatggtggtatgctgctgcgtgatct
gcgtctgccggattttcgcgattatgccgttaaagttgccaatccgggtacagttagcgcagaagcaacccgtacccagggtgaatttattcg
tgatgttgttaaactgaacgccaccaactttcgtgtttttagtccggatgaaacggcaagcaatcgttggggtgccgtttttgaagttaccaatc
gctgtagtaccgcagaaattgttcctggtgatgaccatgtggctccggatggtcgtgttatggaaatgttaagcgaacatcagtgtgaaggtt
ggctggaaggttatctgctgaccggtcgtcatggctttttagctgttatgaagcctttatccacattattgatagcatgtttaaccagcatgccaa
gtggttaaaagtggcaaatgaaattccgtggcgtcgtccgattgcaagcctgaattacctgctgagcagccatgtgtggcgtcaggatcata
atggtttttcacatcaggatccgggttttattgatcatgtgatcaacaaaaaagccgaaattattcgcatctatctgccaccggatgccaatacc
ctgctgtcagttaccgatcattgtctgcgttcacgtaattatgtgaatgttattgttgcgggtaaacagcctcagccgcagtggctggatatgga
tgccgcaattaaacattgtacagccggtattggtatttgggaatgggccagcaatgatcagggcgaagaaccggatgttgtgatggcatgtg
ccggtgatgctccgaccattgaaacactggcagcagttgagctgctgtggaaacattttcctgaactgaaaattcgcgtgattaatgtggttga
tctgatgagcctgcagccacagagtgaacatcctcatggtctgagcgataaagattttgatggtctgtttaccaaggacaagccgattatcttt

gcctatcatggttatccgtggctgattcatcgtctgacctatcgtcgtaccaatcatgataacctgcatgttcgcggttataaagaagaaggtac
gaccagcaccccgtttgatatggttgtaatgaatgatctggatcgctttcatctggtggcagatgtgattgatcgtgttccgcagctgggtagc
cgtgcagcctatgttaaacaggcaattcgcgataaactgatcgaacacaaacagtacattaaccagtatggcgaagatatgccggaaattcg
taattggaaatggaaaggtagcagcgtg **(SEQ ID NO:63)**

Nucleic acid sequence encoding for a phosphoketolase enzyme from *Schizosaccharomyces pombe 972h-*

atggccacccagaatgatattccgaatagcacaccggaagatctggcaaaacaggttgaaattgcagaaaaacatccggatccgcctgca
atgccgagccgtctgccggatagcctgaaaaccctggaagcaaaaattgataccagcaaaattaccgatgaagaggttgcaaatgtgcatc
gttttcagcgtgcatgtgattatctggcagcaagcctgatttttctgagcaatggtctgtataccggtggtgatctggaagagaaagatatcaaa
acccgtctgctgggtcattggggcacctgtccgggtctgagcattgtttatagccattgcaatcgcatcatcaacaaatacgatctgaacatgc
tgtttgttgttggtcctggtcatggtgcaccggcaattctgagcgcactgttcctggaagatagtctgggtccgttttatccgcgttatcagtttac
caaagaaggcctgaataacctgattaacacctttagcctgcctggtggttttccgagccatgttaatgccgaagttccgggtgcaattcatgaa
ggtggcgaactgggttatgcactgagcgttagctatggtgcagttctggatcgtccggatctgattgttacctgtgttgtgggtgatggtgaag
cagaaaccggtccgaccgcaaccagctggcatgcacataaatttcttgatccggcagaaagcggtgccgttattccggttctggaactgaat
ggttacaaaattagcgaacgcaccatttatggttgcatggatgatagcgaactgctgagcctgtttagcggttttggttatgaagttgccattgt
gaatgatacaccggatcagaatcgtgttatggcagccaccatggattgggcagttgaacgtattcatgatatccagcatcgtgcacgtgttaa
tcgcgaagaaattaaaccgcgttggccgatgattattctgcgtaccccgaaaggtaaaggttgtccgaaatatctgaatggcaaatttctgga
aggcacctttcgtgcacatcaggttccgctgaaactggcacgtaccgataccaatcagcgtaatctgctgaaagattggctgaatagctataa
ctgtcaggattttctggatgaacatggtctgccgaccaaaggtattaccgaacatctgcctccgcgtgaaaaacgtatgggtcagcgtcatga
aacctataatagttatctgccactgaaagtgccggactggaagaaatatggtgttaaaaaaggtgaaaccaccagtgcgaccagcgtggttg
gccagtatctggacgagctgctggttaccaatgatagcaccctgcgcatttttagtccggatgaactggaaagcaataaactggatggtgcc
ctgaaacatagctatcgtaccatgcagaccgatccggaactgatggccaaacgtggtcgtgttaccgaagtgctgagtgaacacctgtgtca
gggttttatgcagggttataccctgaccggtcgtaccgccatttttccgtcatatgaagcatttatgaccatcgttgttagcatgctggttcagtat
agcaaattcctgaaaatgggtctggaaacgggttggcatggtaaatttggtagtctgaattatgttaccagcagcacctgggcacgtcaaga
acataatggttttagccatcagagtccgcgttttattaccaccatgctgagtctgaaaccgggtgttagccgtgtttatttttccgcctgatgcaaa
ttgttttctggcaaccgttgcacgttgtatgaaaagcgaaaacaccattaatctgatggtcagcagtaaaaatccgcagcctgcatatctgagc
gtggaagaagcggaacatcattgtaaagccggtgcaagcgtttggaaatttgcaagcaccgataatggtgaaaatccggatgttgttattgc
cggtgttggcaatgaaatcatgtttgaagttgttaaagcagccgaaatgctgcagaacgatatccctgaactgcgtgttcgtgtgattaatgtg
accgacctgatggtgctgagcagtctgcatccgcatggtatgaatcctgcagaatttgattcactgtttacgaaagatcgccacgtgcacttta
actatcatggttatgttatggatctgaaggcactgctgttcgatcgtattcagggcacccgtgtgaccatggaaggttatcgtgaagaaggtac
aaccaccaccccgtttaatatgatgatgtgtaataataccagccgctatcatgttgcccgtatggcactgcagcatgccctgcataatccgacc
gttgcggttaattgtaatatgctgtgtgcaaaatatgcctggaaacttgaagagatcgagaactacatcatggaaaacaaagatgatcctccg
gaaatttatgccgcaccggtgtttaaaaacaaaaccagtaccctg **(SEQ ID NO:64)**

Nucleic acid sequence encoding for a phosphoketolase enzyme from *Lactobacillus buchneri ATCC 11577*

atgaccgtggattacgatagcaaagagtatctggatctgctggataaatactggcgtgcagcaaattatctgagcgttggtcagctgtatctgc
gtgataatccgctgctgaaacgtccgctgaaaagtgatgatgttaaaatcaaaccgattggtcattggggcaccattgttagccagaattttat
ctatgcacagctgaatcgtgccatcaacaaatatgatctgaatatgttctatattgaaggcagcggtcatggtggtcaggttatggttagcaata
gctatctggacggtagctatagcgatatttatccgaatattagccaggacgaaaaaggcatgcagaaactgttcaaacagtttagctttccgg
gtggtgttgcaagccatgcagcaccggaaacaccgggtagcattcatgaaggtggtgaactgggttatagcctgagccatggcaccggtg
caattctggataacccggatgttattgcagcagttgaaattggtgatggtgaaagcgaaaccggtccgctggcagcaagctggtttagcgat
aaattcattaatccgattaccgatggtgcagttctgccgattattaacatgaacggtttcaaaattagcaatccgaccattctgagccgtatgagt
gatgcagatctgacggattatttcaaaggtatgggttgggaagcccattttgttgaagcaaccgcagataccgatcatgcaaaagttgaagcc
gaatttgcaaaaaccctggataccgtgattgagaaaattaagagcatccagaaaaacgcacgcgaaaatgaaactccggataatgttaaact

gccggtttggccgatgattatctttcgtagcccgaaaggttggacaggtccgaaaaaagatctggatggtaacccgattgaaggtagctttcg
tgcacatcaggttccgattccggttgatgcaaatgatatggaacatgcagatgaactggttgactggctgaaatcatataaaccggaagaact
gtttgatgaaaacggcaccctgaaacctgaactgcgtgcactggcaccgaaaggcgaacagcgtatgagcgtgaatccgatcacaaatgg
tggtattaaaccagaacctctgaaactgcctaatgtgcgtgattttgaagtgaaatttgataaacgtgggaccgagcagaaacaggatatgatt
gagtggtcaaaatggctggatgcagttgcaaaactgaacccgaccacctttcgtggttttggtccggatgaaaccaaaagcaatcgtctgtat
tcactgctggacgatggtaaacgtcagtggatggaagatatccatgaaccgtatgatgaggatctggcaaatcatggtcgtgttattgatagc
cagctgagcgaacatcaggcagaaggttggctggaaggttatgttctgaccggtcgtcatggttttttgcaacctatgaaagctttggtcgcg
ttgtggatagcatgctgacccagcattttaagtggctgcgtaaagcaagcgaacagtattggcgtaaacagtatccgagcctgaactttgttg
ataccagcaccgtttttcagcaggatcataatggttatacccatcaggatccgggtctgctgacacatctggcggaaaaaaagccggaattta
ttcgtgaatatctgcctgcagatgccaatgaactgctggcagttggtgatagcgcatttcgtacatatgaaaagattaacctgatcgtgaccag
caaacatccgcgtcgccagtggtatagtatggatgaagcacagaatctggtgaaaaatggtctgggctatatcgattgggcaagcaccgat
cagggtcaagaaccggatgtggtttttgcagccgcaggtagcgaaccgaatctggaagccctggcagccattagtattctgaataaagaatt
cccggaactgaagatccgctttattaacgtggttgatatcctgaagctgaacagccctaaaaaggatccgcgtggtctgtcagatgaagaatt
cgataacctgtttaccaccgacaaaccggtgatttttgcatggcatggctttgaggacatgatcaaagacatctttttgatcgccataaccaca
acctgtatgtgcatggttatcgtgaaaatggcgatattaccaccccgtttgatatgcgtgttctgaacgaactggatcgttttcatctggcagcg
gatgccattcgtcatattccggcatatgcagttaaaggtggctattttatccagcgcatgaacaacatcgtggataaacataatcgctatattcg
cgaagttggtacggatctgccggaagttaccagctggaattgggaaccgctgaacaaa **(SEQ ID NO:65)**

Nucleic acid sequence encoding for a phosphoketolase enzyme from *Streptomyces ghanaensis ATCC 14672*

atgccggaagcaccggatacccgtaccgttctgagtgatgaagaactgcgtaccctggatgcacattggcgtgcagcaaattatctggcag
caggtcagatttatctgctggcaaatccgctgctgaccgaaccgctgcgtccggaacacattaaaccgcgtctgctgggtcattggggcac
cagtccgggtctgaatctggtttatacccatctgaatcgtgttattgcaggtcgtggtctggatgccctgtgtatttggggtcctggtcatggtg
gtccgagcgttctggccaatagctggctggaaggtagctatggtgaaacctatccggatgttggtcgtgatgcagccggtatggaacgtctg
tttcgtcagtttagctttccgggtggtgtgccgagccatgttgcaccggaagttccgggtagcgttcatgaaggtggtgaactgggttatagcc
tggcacatgcatatggtgcagcactggatcatccgggactgctggttgcatgcgttattggtgatggtgaagcagaaaccggtccgctggc
agccagctggcatagcaacaaatttctggatccggttcatgatggcgcagttctgccgattctgcatctgaacggctataaaatcgccaatcc
gaccgtgctggcacgtctgcctgaagatgaactggatagcctgctgcgtggttatggtcatgaaccgattcatgttagcggtgatgatccgg
cagcagttcatcgtgcaatggcccatgcaatggatactgccctggatcgtattgccgaagttcagcgtgccgcacgtgaagatggtgttacc
gaacgtgcacgtacaccggttattgttctgcgcaccccgaaaggttggaccggtcctgcggaagttgatggtaaaccggttgaaggcacct
ggcgtgcccatcaggttcctctggcaggcgttcgtgataacccggaacatctgcgtcagctggaagcatggctgcgtagctatcgtcctga
ggaactgtttgatgatgccggtcgtccggttgcagatgttctggcgtgtctgccagaaggtgatcgtcgtctgggtagcaccccgtatgcaaa
tggtggcctgctggtgcgcgaactgccgatgcctgcgctggatgattttgcagttccggttgataaaccgggtacaaccctgcatgaaccta
cccgtattctgggtggtctgttagaacgtattatgcgtgataccgcagatcgtcgcgattttcgtctggttggtccggatgaaaccgcaagcaa
tcgtctggaagccgtttatgatgcaagcggtaaagcgtggcaggcaggtacactggatgttgatgagcatctggatcgccatggtcgtgtga
tggaagttctgagcgaacacctgtgtcagggttggttagaaggttatttactgacaggtcgtcatggcctgtttagctgttatgaagcatttgtg
catatcgtggatagcatggttaaccagcatatcaaatggctgaaaaccagccgtgaactgccatggcgtgctccgattgcaagcctgaatta
cctgctgacaagccatgtgtggcgtcaggatcataatggttttagccatcaggatccgggttttgttgatcatgttctgaataaaagtccggaa
gtggttcgtgtgtatctgcctccggatgcaaataccctgctgtcagttgccgatcatgcactgcgtagtcgtgattatgttaatgttgttgttgcc
ggtaaacagccgtgttttgattggctgagcattgatgaagcacgtgttcattgtgcacgtggtgcaggcatttgggaatgggcaggcaccga
aaatggcggtgcacctgatgtggttctggcatgtgcgggtgatgttccgacccaagaagtactggcagcggcacagctgttacgtcgtcatc
tgccggaactggcagttcgtgttgtgaatgttgtggatattgcccgtctgatgcctcgtgaagaacatccgcatggtatgacagattttgaatat
gatggactgttcaccgcagacaaaccggtgatttttgcctatcatggttatccgtggctgattcaccgtctggcctatcgtcgtaatggtcatcc
gaatctgcatgttcgtggttacaaagaaagcggtacgaccaccaccccgtttgatatggttgttcgtaatgatctggaccgttatcgcctggta
atggatgttattgatcgtgttcctggtctggccgttcgcgcagcagccgttcgtcagcgtatggcagatgcccgtacccgtcatcatgcatgg
attcgtgaacatggcaccgatttacctgaagttgcagaatggtcttggaatgca **(SEQ ID NO:66)**

Nucleic acid sequence encoding for a phosphoketolase enzyme from *Cyanothece sp. PCC 8802*

atggttgcaacaccggaacgtccgaccctggaacagacaccgctgagcgcagaagaactgcgtcagattcaggcatattggcgtgcatgt
aattatctggcagtgggtatgatttatctgcgtgataatccgctgctgaaagatccgctgaccgaagatcatgttaaaaatcgtctgctgggtca
ttggggtagcagtccgggtctgagctttatctatattcatctgaatcgcctgatcaaaaaatacggcctggatgtgatttatatggcaggtcctg
gtcatggtgcaccgggtattctgggtccggtttatctggaaggcacctatagcgaaacctatccggataaaagcgaagatgaagagggcat
gaaaaaattcttcaaacagtttagctttccgggtggtattggtagccattgtactccggaaacaccgggttcaattcatgaaggtggtgaactg
ggttatagcctgagccatgcatatggtgcagcactggataacccggatctgattgttgcagcagttgttggtgatggtgaagcagaaaccgg
tccgctggcaaccgcatggcatagcaataaattcattaatccgattcgtgatggcgcagttctgccgattctgcatctgaacggctataaaatc
gcaaatccgaccattctggcacgtattagccatgaggaactggaatacctgtttaaaggttatggctacaaaccgtattttgtcgaaggtagcg
atccggaagttatgcatcagaaaatggcagcaacactggaaaccgcaattgccgaaattaaacatattcagcaagaggcacgtaccagcg
gtgttgcaaaacgtcctatttggccgatgattgttctgcgtagcccgaaaggttggacaggtccggcaagcgttgatggcaaaaaaacgga
agatttttggcgtagccatcaggttccgctgagtggtatgcatggtaatccggcacatattaaagttctggaagattggctgaaaagctatacc
cctgaagaacttttgatgaaaacggcaccctgattccggaactgaaagaactggcaccgaccggtcatcatcgtatgagcgccaatccgc
atgccaatggtggtctgctgcgtaaagatctgaaaatgccggattttcgtaattatggtgttgaagttgccaaaccgggtacagttgaagtggg
taataccgcactgctgggcaattttctgcgggatgttatggccaataatatgaccaattttcgtgtgtttggtccggatgaaaccgccagcaac
cgtctgaatgcaatttatgaaatcagcaaaaaagtgtggatgggcgaaattctgccggaagatgcagatggtacagaaatcaccaccgatg
gtcgtgttatggaaatgctgagcgaacataccctgcagggctggctggaaggttatctgctgaccggtcgccatggttttttcatacctatga
agcatttgcccatgtggtggatagcatgtttaatcagcatgcaaaatggctggacatctgcaaaaatgaagttccgtggcgtgccagcgttag
cagcctgaatattctgctgagcagcaccgtttggcgtcaggatcataatggttttagtcatcaggatcctggttatgttgatctggttaccaataa
atcagcggatgttgtgcgtgtttattttcctccggatgcgaattgtctgctgtcagttgcaaatcattgtctgaaatcaaccgattacgtgaacgtt
attgttagcgataagcagatccatctgcagtatctgaatatggatcaggccatcaaacattgcaccaaaggtattggcatttgggattgggcaa
gcaatgatgattgcggtacggaaccggatcatcctgatgttattatggcaagctgtggtgatgttgcaaccaaagaagcactggcagccacc
gccattctgcgcgaagaatttccggatttaaaagtgcgttttatcaacgtggttgacctgttcaaactgcagagtgaaattgaacatcctcatgg
tctgagtgatcgcgattttgataacctttcaccaaagacaaaccgatcatctttaactttcatggttatccgtggctgatccacaaactgacctat
cgtcgtaccaatcatcacaatctgcatgttcgtggttataaagagaaaggcaatattaacactccgctggaactggccattaacaatcagattg
atcgttttaacctggtgatcgatgttatcaatcgtgttccgaaactgggtagcgcagcagcatatgtttatgaacgtatgaaaaacgccatcatc
gaacatcgtgcatatgcctatgaacatggtattgataagcccgagattaacaactggaaatggcctcat **(SEQ ID NO:67)**

Nucleic acid sequence encoding for a phosphoketolase enzyme from *Neosartorya fischeri NRRL 181*

atgaccagcaaaggcgaaattgaaagcctgagcgcatatggtgttgcacgtagcaccattcagggtacaccgctgagccaggatgaactg
cgtaaaatggatgcatattttcgtgcaagcatgtatctgtgtctgggtatgctgtatctgcgtgataatccgctgctgaaagaaccgctgaaagt
tgaacatctgaaagcacgtctgctgggtcattggggtagtgatgccggtcagagctttacctggattcatatgaaccgtctgatcaaaaaata
cgatctggatgtgctgtttattagcggtccgggtcatggtgcaccgggtattctgtcacagagctatctggaaggtgtttataccgaagtttatc
cggaaaaaacccaggacgaaaaaggtctgcagcgtttttttcaaacagtttagctttccgggtggtattggtagccatgcaacaccggaaaca
ccgggttcaattcatgaaggtggtgaactgggttatagcattagtcatgcatttggcaccgtttttgatcatccgaatctgattaccctgaccatg
gttggtgatggtgaagcagaaaccggtccgctggcaaccagctggcatagcaacaaatttctgaatccgattacagatggtgcagttctgcc
ggttctgcatctgaatggctataaaatcaataacccgaccattctggcacgcattagccatgaagaactggaaatgctgttaaaaggttatggt
tggaccccgtattttgttgaaggtagcgatcgtgaaagtatgcatcaggcaatggcagcaaccctggaacattgtgttctggaaattaagaag
atccagaaacaggcacgcgaaagcaataaagcatttcgtccgctgtggccgatgattgttctgcgtagcccgaaaggttggagcgcaccg
cgtgaaattgatggtaaatacctggaaggcttttggcgtgcacatcagattccgatcaccgatgttcagagcaaaccggaacacttaaaagt
gctggaaaattggatgaaagcgtataagccggaagaggtgtttgataaaaatggcaccctgattccggaactgaaagagctggcaccgac
cggcaccagccgtatgagcgcaaatccggtgggtaatggtggtctgctgcgtcgtccgatggatctgccggattttcgcgattatgcactga
ccgatattgaaccgggtgttaccattcgtccgagcatgagcaatatgagcaaatatctgcgggatgttgttgcccgtaatatgaccacctttcg
tgtttttggtccggatgaaaccgaatcaaataaactggccgaaatctacaaagccggtaaaaaggtttggatggccgaatatttcaaagaaga
tgaggacggaggtaatctggatatgcagggtcgtgtgatggaaattctgagcgaacatacatgtgaaggttggctggaaggatatattctga

gtggtcgtcatggcatgctgaatagttatgagccgtttattcatgtgatcgacagcatggttaatcagcattgcaaatggattgaaaaatgcctg
gcagttgaatggcgtgccaaagttagcagcctgaatattctgctgaccgcaaccgtttggcgtcaggatcataatggttttacccatcaggat
ccgggttttctggacgttgttgcaaataaaagtccggaagttgtgcgtatttatctgcctccggatggcaataccctgctgagcaccatgaatc
attgttttcgtagcgtgaattacgtgaatgtgattgtggcagataaacaagaacatgtgcagtttctgaacatggaagaagcaattgaacattgc
accaaaggtgttggtatttgggattgggcaagcaatgatcagggttgcgaaccggatgtggttatggcaagctgtggtgatgttgcaaccca
tgaagccctggcagccaccgcactgctgcgcgaacatttaccgcagttaaaagttcgttttgttaatgtggttgacctgtttcgtctgattagcg
atattaatcatccgcatggtatgccggatcgtcagtggggtgcaatttttaccaccgataaaccgatcatctttaactttcatagctatccgtggc
tgattcatcgtctgacctataaacgtcctggtcagcataatctgcatgtgcgtggttataaagaaaaaggcaatatcgatacccccgtttgaactg
gcggttcgtaatcagaccgatcgttatagcctggccattgatgcaattgatcgtattccgagcctgggtaataccgcaagcggtgttcgtgaa
cgcctgattaacctgcaactggcagcgaaaaacaaagcctttgatgatggtattgatccggattatattcgcaattggacctgggattatccgc
gtaaaaaatgc **(SEQ ID NO:68)**

Nucleic acid sequence encoding for a phosphoketolase enzyme from *Enterococcus faecium TX1330*

atggattatagcagcaaagaatattttgataaaatgaccgcatggtggcgtgcagcaaattatctgagcgttggtcagatttatctgaaagata
atccgctgctgcgtcgtaccctgaaaccggaagatgttaaaaaacacccgattggtcattggggcaccattccgggtcagaattttatctatgt
tcatctgaatcgcgtgatcaacaaatacgatctgaacatgttttatatcgaaggtcctggtcatggtggtcaggttatggttagcaatgcatatct
ggatggtagctataccgaaatttatccggaagttaccgaagatgaaacgggtatgcagaaactgtttaaacgttttagctttccgggtggtatt
gcaagccatgcagcaccggaaacaccgggtagcattcatgaaggtggtgaactgggttatagcctgagccatggtgttggtgcagttctgg
ataatcctgaagttattagcgcagttgttattggtgatggtgaagcagaaaccggtccgctggcaggtagctggtttagtaatgtttttatcaatc
cggttaccgatggtgcggtgctgccgattctgcatctgaacggtgcaaaaattgcaaatccgaccattctggcacgtaaaagtgatggcgaa
ctggccaattatttcaatggtctgggttgggaaccgtttttcattgaaggtaatgatccggaaaaactgaatccggtgatggcagaaaaaatgg
atcaggccattgagaaaatcaaaagcattcagaaagaagcccgtctgaaaaccgcagcagatgcaatgatgccgaaatggcctgttctgat
tgtgcgtaccccgaaaggttggacaggtccggaagaatgggatggtgagccgattgaaggcacctttcgtgcacatcaggttccgattccg
gttgatcaagaacatatggatcatgcagatgccctgctgcgctggctgaaaagctatgaaccagaaaagctgtttgatgcacagggtcgtatt
ctggaagaaattcgtgaaattgcaccgaccggtgatcatcgtatggcaaaaaatccgattacaaatggtggtatggatccgaaaccgctgat
tatgccggattggaaacgttataccctgcagtttgaaaaaccgggttcagttaccgcagaagatatgaccgaactgggcaaatttgttcgcga
aatcattgaaaaaaacccggaaaactttcgcatctttggtccggatgaaaccaaaagcaatcgtctgaatcaggtgtttaaaaccaccaatcg
tcagtggatggaaaaaattgaaccggaaaatgatgaatggctgagcccgagcggtcgtgttattgatagccagctgagcgaacatcaggat
gaaggtttttagaaggttatgttctgaccggtcgccatggtttttttgcaagttatgaaagctttctgcgtgtggttgatagcatgctgacccagc
actttaaatggatgcgtaaaagccgtgatctgagctggcgtaataactatccgagcctgaatctgattgcaagtagcaccgtgtttcagcagg
atcataatggttatagtcaccaggatccgggtattctgacccatctggccgaaaaaaaagcagaatttattcgtgagtatctgcctgccgatgc
aaatacactgctggccgttatggataaagcatttcgtagcagcgaaaagatcaacctgattatcagcagtaaacatccgcgtgcacagttttat
agtgcagaagaagcagccgttctggttaatgaaggcctgaaaattatcgattgggcaagcaccgcaaaagaagaagaacctgaactggta
attgcagcagcaggcaccgaaagtaatctggaagcactggcagcagttactctgctgctggaagagtttccgaaactgaaaatccgctttat
taacgttgtggacctgctgaaactgcgtcatccgagtcaggatcctcgtggtctgagtgatgaagaatttgacaaatactttaccaaagataaa
ccgatcctgtttgcctttcatggctatgaaacactgattcgcaccatctttttgatcgccataatcatcatctgatgattcacggctataaagaga
atggcgatattaccaccccgtttgatatgcgtgttgtgaatgaactggatcgttatcatctggcaaaagatgcagccctgaagattaaaggtag
ccaggccgaagattttgccaaaaagatggaccaaaaactgcaagaacaccagaactatatccgcgaaaatggtattgatctgccggaagt
gctggactggaaatggaagaatctggatcag **(SEQ ID NO:69)**

Nucleic acid sequence encoding for a phosphoketolase enzyme from *Listeria grayi DSM 20601*

atgaccgattatagcagcccgaactatctggcaaaagttgatgcatggtggcgtgcagcagattttatcagcgttggtcagctgtatctgaaa
ggtaatccgctgctgcgtcgtccgctggaaaaagaagatttaaaagttcatccgattggtcattggggcaccattagcggtcagaattttatct
atgcacatctgaatcgcgtgatcaacaaatatgatctgaatatgttctacatcgaaggtccgggtcatggtggtcaggttatggttagcaatag
ctatctggatggtagctataccgatacctatccgaccattacccaggatgaagttggtctgaccaaactgtataaacagtttagctttccgggtg

gtattgcaagccatgcagcaccggaaacaccgggtagcctgcatgaaggtggtgaactgggttatgcactgagccatgccaccggtagca
ttctggataatccggatgttattgcagcaaccgttattggtgatggtgaagcagaaaccggtccgctgagcgcaggttggtttagtaataccttt
attaacccggttaatgatggtgcagttctgccgattctgtacctgaatggtgcaaaaattagcaatccgacaattctgagccgcaaaaccgata
aagaactgaccagctttttcagggtctgggttgggatccgatttttgttgaaggtgaagatcctgccaaagtgcatccgctgatggcagaaa
aactggatcaggcaattgaaaaaatcaaagccattcagaccgaagcacgtaaagaagccgcagataaagcaaccatgccgacctggcct
gttattctgtttcgtaccccgaaaggttggacaggtccgaaagaatggaataatgaaccgattgaaggtagctttcgtgcacatcaggttccg
attccggttgatcagcatcattttgatcatgttgatgccctggaaaattggctgcagagctatcgtccggaagaactgtttaccgaagaaggta
gtctgaaagaagaaatcaaaagcctggcaccgaaaaatcgtatggcaaccaatccgattaccaatggtggcattgatccgcagccgctgc
gtctgccgagctggaaagattatgcagttgaaaccgcaaacaaagatgtgattacgcaggatatgattgagctgggtggttttgttcgtgatat
cgttaaagaaaacccggataactttcgcatttttggtccggatgaaaccaaaagcaatcgcctgaataaagtgtttgaagtgaccaatcgtca
gtggatgagcaaagcagaatttccgcgtgatgaatggctggctccggcaggtcgtattattgatggccagctgagcgaacatcaggcaga
aggttttctggaaggttatgttctgaccggtcgtcatggtttttttgcaagctatgaaagctttctgcgtgttgttgatagcatgctgacccagcac
tttaaatggctgcgtaaagcaaaagaacagacctggcgtaatagttatccgagcctgaatgtgattgcaaccagcaccgtttttcagcaggat
cataatggttatacccatcaggatccgggtgtgctgacacatctggccgaaaaaaaaccggaatttatccgtgaatatctgcctgcagatacc
aatagcctgctggcagttatgaatgaagcatttcgtagcgaggaactgattaatctgattgtgagcagcaaacatccgcgtccgcagttttata
gcgcagaagaagctgaaattctggttaaagatggcctgaaaatcattgattgggcaagcaccgtgagcgaagccgaagaaccggatgtg
gttattgccagtgcaggtacagaaccgaatctggaagcactggcagcagttaccctgctgaacgaagcctttccgtcgctgaaaattcgcttt
atcaacattgtggacattctgaaactgcgccatccggatatcgatccgcgtggcctgaccgatgaagaatttgatcgttatttcaccacggac
aaaccgatcatttttgcctttcattcatatgaaggtatggtgcgcgatatctttttaaccgccataatcacaacctgttcatccatggttatcgcga
aaatggtgatattaccaccccgtttgatatgcgtgttctgagtgaaatggatcgttttcacctggccaaagatgcagccgaagcagtttatggt
gaaattgcgaccagttttgccgcagaaatggacgccgttctgtcaaaacatcatcactttattcgtgaaaacggcgaagatctgccggaagtt
gagaattggaaatggcaggcactgaaaactgacctgctggaagtg **(SEQ ID NO:70)**

Nucleic acid sequence encoding for a phosphoketolase enzyme from *Enterococcus casseliflavus EC30*

atgaaaaccacctacgataccccctgagtattaccagaaaatgaatgcatggtggcgtgcagcaaattatctgagcgttggtcagatttatctg
aaagataatccgctgctgcgtcgtccgattgaagaaaaagacctgaaagtgaatccgattggtcattggggcaccattgcaggtcagaatttt
atctatacccatctgaatcgcgtgatcaacaaatatgatctgaatatgttctacatcgaaggtccgggtcatggtggtcaggttatggttgcaaa
tgcatatctggatggtagctatagcgaaatctatccgaaagcaacccaggatgaagcaggtatgaaacacctgtttaaaaccttagctttccg
ggtggtattgcaagccatgcagcaccggaaacaccgggtagcattcatgaaggtggtgaactgggttatagcattgcacatgcaaccggtg
caattctggataacccggatgttattgcagcagttgttgttggtgatggtgaagcagaaaccggtccgctggcaggtagctggtttagcaata
cctttattaacccggttaacgatggtgccattctgccgattctgcatctgaacggtgcaaaaattgcaaatccgaccattctggcacgtaaaag
cgatcaggatctgaccaaatatttcgaaggtatgggttggaccccgtattttgttgaaggtgatgatccggaagcagttcatccgcagctggc
acaaaaaatggatcaggcaattgagcagattcatgcaattcaggcagaagcccgtaaaggttcagccgaagaggcagcaatgccgcattg
gcctgttctgattgttcgtaccccgaaaggttggacaggtccgaaagtttgggatggcgaaccgatcgaaggcggttttcgtgcacatcagg
ttccgattccggttaatgcaaaacatatggaacatgttgatgcactgaccgattggctgcagagctatcgtccggaagaactgtttgatgaaaa
tggtcgtattaaggccgaaatccaagaactggcaccgaaaggcgaacagcgtatggcagttaacccgattaccaatggcggtattgatcct
cagccgctgcgtctgccggattggcaggcacatgccattgcaattgaaactccgggtgaaaccaccgcacaggatatgatggtttttggtaa
atttgcccgtgatattatcaaagagaacccggacaattttcgcatttttggtcctgatgaagccaaaagcaatcgtctgaatcatgtgtttgaagt
taccgatcgtcagtggctggaaccgaaacatccggattatgatgaatggctgagcagcgtgggtcgtgttattgatagccagctgagcgaa
catcaggccgaaggttttctggaaggttatgttctgaccggtcgccatggctttttgcaagctatgaaagctttctgcgtgttgtggatagcatg
attacccagcactttaaatggctgcgtaaagcacatgatctggattggcgtaatccgtatccgagcctgaatctgattgcaagtagcaccgtttt
tcagcaggatcataatggttatacccaccaggatccgggtattatgacccatattgcagaaaaaaaaagccgattttgtgcgtgtttatctgcctg
cagatgcaaatagcctgatggccgttatggccgaaaccctggcaagcgaagaaaagattaatctggttgttagcagcaaacatcctcgtcc
gcagttttatagcgcagatgaagcgaaagttctggtgaaagatggtctgaaagttatcgattgggcaagcaccgatgaaggtcaagaaccg
gatattgtgattgcagccgcaggtacagaaccgaatctggaagcactggcagccgttagcctgctgattgaagcatttccggaactgaaagt
ccgttttatcaatgttgttgacctgctgaaactgcgtcgccctgaagttgatccgcgtggtctgagcgacgaagcctttgaagcctattttacca

aagataagccgatcgtgtttgcctttcatggttatgaaggcctgattcgcgatatctttttggccgtcgtaatcagcagctgcatattcatggcta
tcgcgaaaacggcgatattaccaccccgtttgatatgcgtattctgtcagaactggatcgttttcatctggcaaaagatgcagcagaatgggtt
tatggtgaaaaagccacagattttgcacagaagatggcagataccgttgcatatcatcatgattttatccgcgagaacggttatgatattgccg
aagttgaagaatgggaatggaaaccgctgcgc **(SEQ ID NO:71)**

Nucleic acid sequence encoding for a phosphoketolase enzyme from *Mycoplasma alligatoris A21JP2*

atgaaaaagaataccttcgatacccaggactatctggataaagttgatgcatggtttcgtgcagcaaattatctgagcgttggtcagatgtatct
gcgtaataatccgctgctgcgtagcaaaattaccagtgatgatgttaaagtgtatccgattggtcattggggcaccattccgggtcagaatttt
gcatatgcacatctgaatcgcgtgatcaacaaatacaatctgaatatgttctacatcgaaggtcctggtcatggtggtcaggttatgaccagca
atagctacctggatggtagctataccgaactgtttccgcatgtgacccaggatgttgcaggtatgaaacacctgtttaagtattttagctttccg
ggtggcaccgcaagccatgcagcaccggaaacaccgggtagcattcatgaaggtggtgaactgggttatagcctgagccatgccaccgg
tgcaatcctggataatccgaatgttattgcagcaaccattgttggtgatggtgaagcagaaaccggtccgctggcagcaagctggtttagca
atagttttatcaatccggttaatgatggtgccgttctgccgattctgcatctgaacggtggtaaaattagcaatccgaccattctgtgtcgcaaaa
gcaataaagaactgaccgattattttgccggtatgggttgggaagcagtttttgttgaaggtagtgatgagaaagaaatgcacaaagttatgg
cccagaaactggattatgtgatcgaaaaaattcagagcattcagaacgaggcacgtaaaaaaccggcaaatcaggcaacccgtccgatttg
gccgatgatggttctgcgtaccccgaaaggttggacaggtccggatagctggaataaagataaaattgtgggtagctttcgtgcccatcagg
ttccgattccggtgaatagcgcaaatatggaacatattgatgcactgctggattggctgaaatcctataaagtggataacctgttcgacaaaaa
tggcaaactggttgatgaaattgcacagattgcaccgaaaggcgatcagcgtatgggtatgaatccgattaccaatggtggcctgaacccg
aaaaaactggtaatgcctcgttggcaggattttgcactgaaattttcaaaaccgggtgagctggttaatcaggatatggttgagctgggcacct
attttgcaaaaatgatggaactgaacaaggacaactttcgtctgtttggtcctgatgaaaccaaaagtaatcgcctgtataacgtgttcaaagtg
accaaacgtcagtggctggaaccgattagccctattctggatgaagcactgagtccggaaggtcgtgttattgatagccagctgagcgaac
atcaggcagaaggttttctggaaggttatgttctgaccggtcgccatggtgtttttgcaagctatgaaagctttctgcgtgttgtggatagtatgc
tgacccagcacctgaaatggctgaagaaagcaaaagatgttcattggcgtaatgattatccgagcctgaatgtgattgcgaccagcaccgc
atttcagcaggatcataatggttatacacatcaggatccgggtctgattggccatctggcagataaaactccggaaattattcgtcagtatctgc
ctgcagataccaataccctgctggcagttatggataaaagcctgaaagaacgcaacgtgattaaccatatcattgcaagcaaacagcctcgc
gaacagttttatagcgaacaagaagcagcagaactggtagaaaaaggtctgaaagtaattgattgggcaagcaccaccaaaggtaatgaa
gaaccggaactggtggttgttgcagcaggcaccgaaccgaatctggaagccctggcagccgtgacgattctgaacaaagagtatccgtca
ctgaaaatccgttttgtgaatgtggttgatctgatgaagctgcgtcatccgagtctggatccgcgtggtctgagcgataaagaatttgatgcaat
tttcaccagcaacaagccgattgtgtttgcctttcatggttatgaaggtattctgcgcgacatgtttttcaaacgcaataaccataatctgatcacc
catggctatcgcgaaaatggtgatatcacaaccagctttgatattcgccagctgtcacatatggatcgctttcatattagcgcaagcgcagcaa
aagcggtgtatggtaataaagcacaagagttcgaggacaaaatgatccagaccattgatttccacaccaaatatatccgtgaatatggcacc
gatattcccgaagttaaagaatggaaatgggcagatctgacccgtaaa **(SEQ ID NO:72)**

Nucleic acid sequence encoding for a phosphoketolase enzyme from *Carnobacterium sp. 17-4*

atgaaaaactatgatagcaaagattatctgaaaaaagtggacgcattttggcgtgcagcaaattatctgtcagttggtcagctgtatctgcgtg
ataatccgctgctgcagcgtccgctgaaaagcaccgatgttaaagcacatccgattggtcattggggcaccattagcggtcagaatttatct
atgcacatctgaatcgcgtgatcaacaaatatgatctgaatatgttctacatcgaaggtccgggtcatggtggtcaggttatgattagcaatgc
atatctggatggtagctataccgaaatctatccggatatcaccgaaaacaaagaaggcatgaagaaactgttcaagcagtttagcagtccgg
gtggtgttgcaagccatgcagcaccggaaacaccgggtagcattcatgaaggtggtgaactgggttatagcctgagccatgccaccggtg
caattctggataacccggatgttattgcagcaaccgttattggtgatggtgaagcagaaaccggtccgctggcagcaggttggtttagcaata
atttcattaatccggtgaatgatggtgccgttctgccgattctgtacctgaatggtggtaaaattagtaacccgaccattctggcacgtaaaagc
aatgaagatctgaagaaatatttcgagggtatgggttggaaaccgtattttgttgaaggcaccgatccggaaaaagttcatccggttatggca
aataccctggatgttgttatcgaagaaattcgcagcattcagaatgaagcccgtaaaggtaaagccgaagatgttgaaatgccgcattggcc

tgtgatgattattcgtaccccgaaaggttggacaggtccgaaagaatgggataacaaaaaaatcgaaggcacgtttcgtgcacatcaggttc
cgattccggttgatgcagaacatatggaatatgtgaataaactggtggactggctgaaatcatatcgtccggaagaactgtttaccgaaaatg
gcaaactgatcgatgacctgaaagaactgacaccgaaaggcaataaacgtatggcaaccaatccgattaccaatggtggcattaatgcaaa
agcactgattatcccgaattggaaacagcatgcaattgataccaccattccgggtgcagttattgcccaggatatggatgtttttggtgaacag
gcacgtgatctgattgttaaaaatccgaacaactttcgcatcttcggtccggatgaaaccaaaagtaatcgcctggataaaatctttgaagtga
ccaatcgtcagtggctggaaagcaaagaattaaccgatgaatggcagagcagcgcaggtcgtgttattgatggccagctgagcgaacatc
aggcagaaggttttctggaaggttatgttctgaccggtcgtcatggtttttttgcaagctatgaaagctttctgcgtgttgttgatagcatgctgac
ccagcactttaaatggctgcgtaaagcaaccgatcagaaatggcgtaataactatccgagcctgaatgtgattgcaaccagcaccgtttttca
gcaggatcataatggttatacccatcaggatccgggtattctgacccatctggcagaaaaaaaaccggaatttatccgtgaatatctgcctgc
agatgcaaatagtctgatggcagttatggacaaaacactgcaagaagaacagctgattaacctgatcattagcagcaaacatccgcgtccg
cagttttatagcgttgaagaagccgaaattctggttaaagatggcctgaaaattatcgattgggccagtaccgataatgatagcgaaccggat
ctggttatcgcagcagccggtacagaaccgaacctggaagcactggcagccatgagcattctgcacaaagcatttccggaactgaaaatc
cgctttatcaacattgtggacattctgaaactgcgtcacccggatattgatagccgtggtctgacagatgaaaaattcgatagctatttcaccaa
agagcagccgattatctttgcctttcatggctttgaaggtctgattcgcgatatctttttaaccgccataaccataatctgcgcattcacggttatc
gtgaaaatggtgatattaccaccccgtttgatatgcgtgttctgaatgaaatggatcgttttcatctggccaaagatgccgcaaaagccgtttat
ggtctgaaagccaacaaattcatgcaagagatggaaaacaccgtgaactttcatcatcagtatattcgcgaaaacggcattgatattccggaa
gtgattaactggaaatgggaaaaaatc **(SEQ ID NO:73)**

Nucleic acid sequence encoding for a phosphoketolase enzyme from *Melissococcus plutonius ATCC 35311*

atggaaaaagataaatacagcagcaccgagtacctggacaaaattgataaatggtggcgtgcagcaaactatctgagcattggtcagctgt
atctgaaagataatccgctgctgaaacgtaaaattcgtagcgaggatgttaaatatcatccgattggtcattggggcaccattgcaggtcaga
attttatctatgcacatctgaaccgcattatcaacaaatacgatctgaatatgttttatatcgagggtccgggtcatggtggtcaggttatggttag
caatagctatctggatggtagctataccgaaatttatccggcagttaccgaagatgaagcaggtatgcagaaactgtttaaacgttttagctttc
cgggtggtgttagcagccatgccgcaccggaaacaccgggtagcattcatgaaggtggtgaactgggttatagcctgagccatggtgttg
gtgcaattctggataacccggaagttattagcgcagttgttattggtgatggtgaaagcgaaaccggtccgctggcgaccagctggtttagta
atacctttattaacccggttaccgatggtgccgttctgccgattctgcatctgaatggtgcaaaaattgcaaatccgaccattctgggtcgtaaa
agcgataaagaactggaacagtattttcgtggtatgggttggattccgtattttgtggaaggtaatgatccgaatcagatgcatccgctgatgg
caaaaaccctggatcaggtgattgaaaaaatccacagcattcaagaaaccgcacgtaaacagaccgcagaaacagcaagtattcagaaat
ggcctctgattgttctgcgtaccccgaaaggttggacaggtccgaaagaatgggatggtaaaccgattgaagttacctttcgtgcacatcag
gttccgattccgattgatcaggatcatatggaacatgttgatcagctggtgaattggctgaaaagctataaaccggaagaactgtttgatgaaa
caggtcgtctgaatagcgaaattcgtgccattgcaccgatgaatgataaacgtatggcaatgaatccgattaccaatggtggtattaatccga
aaccgctgcagatgccggattggcgtgaatttgatctgcatattagcaaaccgggtgagctggttgcacaggatatgctggaatttggtaaaa
tggttgcagccatcatcaaaaaaaacccgcagaactttctgatctttggtccggatgaaaccaaaagcaatctgctgaatgatgcatttagcgt
taccagccgtcagtggctggaaccgatttatgaacctcaggatgaatggctggcaccgtcaggtcgtattattgatagccagctgagcgaac
atcaggacgaaggtattctggaaggttatgttctgaccggtcgtcatggtttttttgcaagctatgaagcctttattcgcatcgtggatagcatga
ttgcccagcatatcaaatggatgcgtaaagcaatggatctgccgtggcgtaatggttatagtagcctgaatctgattgcaagcagtaccgcat
ttcagcaggatcacaatggctatacccaccaggatccgggtatcctgagtcatctggcagaaaaagaagcagattttatccacgaatatgtg
cctgcagataccaatagcctgctggcagttatggataaagttctgaaaagtcagggcaaagtgaatctggtgattagctcaaaacatccgcg
tccgcagttttatagccctgaagaagcacaagaattagttaatcgtggcctgatggaaattgattgggcaagcaccgttgcagaaaatggca
ctccggaaattgtgattgttgccgcaggcaccgaaccgaatatggaagcactggcagcaattaatctgatcaatcagagttttccgaaactgc
agttccgctttatcaatgttgtggatttactgaaactgcgtcatcctgcagttgattcaagaggtattagcgaagtggaatataaccacctgttta
ccgttgattccccgattatctttgtttgtcagggttattcaagcctgattcgcagcctgttctatgatcgtaaaaatcgtccggttagcatccatag
ctaccaagaaaacggtgccattaccaccccgtttgatatgcgtgttctgaataaaatcgatcgttatcacctggccaaagatattgcactgacc
gcatatggtagccgtggtgaagattttgcacgtgccatggataccatcctggaaaaacacaatcagtatattcgcgaaacgggtaaagatct
gcctgaagtgctgaattggaaatgggctccgctgcatatctataacgaaaacattgaacaggat **(SEQ ID NO:74)**

Nucleic acid sequence encoding for a phosphoketolase enzyme from *Tetragenococcus halophilus NBRC 12172*

atgagcgtgaacatcgacagcaaagaatatctggaacgtatgaatgcatggtggcgtgcagcaaactatattagcgttgcacagatttttctg
cgtgataatccgctgctgcgtcgtccgctggaaaaagaagatatcaaaattaacccgattggtcattggggcaccattagcggtcagaatttt
atctatgttcatctgaaccgcgtgatcaacaaatatggtctgaacatgttttatatcgaaggtccgggtcatggtggtcaggttatggttagcaat
agctatattgatggcagctatagcgaaatctatccggatgttacccaggatgaagcaggtctgaaaaaactgttcaaacagtttagctttccgg
gtggtatgggtagccatgcagcaccggaaacaccgggtagcattcatgaaggtggtgaactgggttatagcatgagccatgccgttggtgc
agttctggataatcctgatgttattgcagcaaccgttattggtgatggtgaagcagaaaccggtcctctggcagcaagctggatgagcaataa
tttcattaatccggtgaatgatggcgcagtgctgccgattctgaatctgaatggtgcaaaaattgcaaatccgaccgttctggcacgtaaaagc
gataaagatctgcagaaatactttgaaggtctgggttggaaaccgtattttgtggaaggtgataacccggaaaaaatgcatccgctgatggc
cgaaaccctggatgcagttattaacgaaattcagagcattcagaaagaagcccgtaaaggttcagccgaagatgtgaccatgccgcattgg
cctgttattgtttttcgtaccccgaaaggttgggaaggtccagaaaaatgggataatgagcagattgcaggcacctttcgtgcacatcaggttc
cgattccgattgatgcaagccatatggaatatgcaaatgatctggcaaaatggctgaaaagctatcgtccggaagaactgtttgatgaaaatg
gcacaattattgatgcgattaaagaactgagtccgaaaggcgataatcgcatgagtgttaatccgattaccaatggtggcctggatccgaaa
gcactgaatatgcctgattggcatacccatgcagttgataccagcaaacgtggcaccgataaagcacaggatatgagcgttctgggtggtttt
attgccgatattatggaaaacaacccgaagaactttcgcatttttggtccggatgaaaccaaaagcaatcgcctgaataaagtttttgatgtga
caaatcgtcagtgggttgaacctcgtgaactgtcagatgaatggcagagcgcagttggtcgtgtgatcgatggtcagctgagcgaacatca
ggcagaaggttttctggaaggctataccctgaccggtcgtcatggttttttgcaagctatgaagcatttctgcgcattgttgatagcatgctga
cccagcactttaaatggattcgtaaagccaatgaaaaaagctggcgcaaaaaatacccgagcctgaatgtgattagcagcagtaccgcattt
cagcaggatcataatggttatacccatcaggatccgggtgtgattacccatctggcagaaaaaaaaccggaatatatccgcgaatattttccg
gcagatgcaaatagcctgatggcggttatggataaagccctgaaagatgaaaacgtcattaacctgattacctcgagcaaacatccgcgtcc
gcagttttatagcgttgaagaagcacaagaactggtcgattatggcgtgaaaaaaatcgattgggcaagcaatgatcaggatagcgaaccg
gatattgtgtttgcagcagcaggtagtgaaccgaatctggaagcactggcagcgattagcattctgcatgaacagtttccggaaatgaaaatc
cgctttatcaatgttgtggacctgctgaaactgcgtcatccagatgttgatccgcgtggtctgagtgatgaagcctttgatgagctgtttaccac
agataaaccggtgatctttaactttcatggttatgaaggcctgattcgcgatatctttttttacccgtcataatcgtaatctgagcatccatggctatc
gtgaagatggtgatattaccaccccgtttgatatgcgtgttaaaaatgaactggatcgctttcatctggccaaagatgcagccaataccatttat
gccgaaaaagcagccgatttcatccaagaaatggacaaaaccctgcagtatcaccatgattatattcgcgaaaacggtgatgatatcagcg
aagttcagaattgggaatggaaagacctgaaa **(SEQ ID NO:75)**

Nucleic acid sequence encoding for a phosphoketolase enzyme from *Melissococcus plutonius DAT561*

atgaccaaatatgatagcaaagaatatctggccaaagtggatgcattttggcgtgcagcaaactatattagcgttggtcagctgtatctgaaag
ataatccgctgctggatcgtccgattgaaaccaccgatgttaaagttcatccgattggtcattggggcaccattagcggtcagaattttatctat
gcacatctgaatcgcgtgatcaacaaatacgatctgaacatgttttatgtggaaggtccgggtcatggtggtcaggttatggttagcaatagct
atctggatggtagctataccgaaatctatccggaaatcaccgaagataaagagggtctgaaaaaactgttcaaacagtttagctttccgggtg
gtattgcaagccatgcagcaccggaaactccgggtagcattcatgaaggtggtgaactgggttatagcattagccatgccaccggtgcaatt
ctggataacccggatgttattgcagcaaccgttgttggtgatggtgaagcagaaaccggtccgctgagcgcaggttggtttgcaaatacctttt
attaacccggttaacgatggtgccattctgccgattctgtacctgaatggtggtaaaattagcaatccgaccattctggaacgcaaaagtgatg
aagaactgaccaagtattttgaaggtatgggttggaaaccgtattttgttgaaggcaccgttccggataaagtgcatcctctgatggcaaaaat
cctggatcatatcatcgaagaaatcaaagatattcagaaagaagcccgtaaagacaaagccgaaaatgcaaaaatgccgcattggcctgtt
ctgattatgcgtaccccgaaaggttggacaggtccgaaaatttgggatgatgaaaaaattgagggcacctttcgtgcacatcaggttccgatt
ccggttgatgcagaacatatggaacatattgatgcactggttgattggctgaaaagctatcatccggaagaacttttgataaaaacggcacc
ctgaaaccggaactgaaagaactggttccgaaaggcgatcgtcgtatggccaaaaacccgattaccaatggtggcctggatccgaaaccg
ctgaaaatgaatggttgggaacagcatgcaattgataccagcacaccgggtatggttaccgcacaggatatgattgtttttggcaattatgtcg
aagatctgatcaaagcaaacccgaccaattttcgtatttttggtccggatgaaaccaaaagcaatcgcctgaataaagtgtttgatagcaccg
atcgtcagtggatggaaccgattagtaatgcagatgaatggcagagcagcgtgggtcgtgttattgatggccagctgagcgaacatcaggc

agaaggttttctggaaggttatattctgaccggtcgtcatggtttttttgcaagctatgaaagctttctgcgtgttgtggatagcatgctgaccca
gcactttaaatggctgcgtaaagcaaaagaacagagctggcgtaaagagtatccggcactgaacattattgcaaccagcaccgtttttcagc
aggatcataatggttatacccatcaggatccgggtatcctgacccatctggcagaaaaaaaaagcagaatatatccgtgaatacctgcctgca
gatgcaaattgcctgatggccgttatggataaagcctttcaagaaaacgaagtgattaacctgattgtgagcagtaaacatccgcgtccgca
gttttatagcgttaccgaagccaaagaattggttgataaaggcgtgaaagtgattgattgggcaagcaatgatgaaggtcagacaccggata
ttgtgattgcagcgagcggcaccgaaccgaatctggaagcactggcagcaattaccctgctgaacaaagagtttattgatctgaaaatccgc
ttcgtgaacgtggtggatatcctgaaactgcgtcatccgagcattgatccgcgtggtctgaccgatgaagagtttgatgcaattttcaccaagg
acaaaccgattgtgtttgcctttcatggctttgaaggcctgattcgcgatatctttttagccgtagcaatcatcagctgtttgtgcatggttatcgt
gaaaaaggtgatattaccaccccgtttgatatgcgtgttctgagtgaaatggatcgttttcacctggcaaaagatgttgccgacaaagtgtata
atgaacaggcagccgattttatgaatcgcatggatgaaattctggcctttcaccatcagtatattcgcaaaaacggtatcgatattccggaagt
ggttaactggaaatgggaggatctgcgcaaaaaaacgatttgctttaat **(SEQ ID NO:76)**

Nucleic acid sequence encoding for a phosphoketolase enzyme from *Mycoplasma arthritidis 158L3-1*

atgaaaaaaaccaattatgatagcaatgaatatttcaatctgattgataaatggtttcgcgcagccaattatctgagcgttggtcagatttatctg
cgtaataatccgctgctgaaaaccaaactggttgcagatgatgttaaaatctatccgattggtcattggggcaccattccgggtcagaattttat
ctatgcacatctgaatcgcgtgattaacaaatacgatctggaaatgttctatatcgaaggtcctggtcatggtggtcaggtgatgattagcaata
gctatctggatggtagctataccgaaatttatccggaaatcaccgaagatgaagcaggtctgaaaacgatgtttaaacgttttagctttccggg
tggcaccgcaagccatgcagcaccggaaactccgggtagcattcatgaaggtggtgaactgggttatgcactgagccatgccaccggtgc
aattctggataatccgaatgttattgcagcaaccgttattggtgatggtgaagcagaaaccggtccgctggcagcaggttggtttagcaattct
tttatcaatccggttaatgatggtgccgttctgccgattattcatctgaacggtgcaaaaatttccaacccgaccattctgagccgtaaaagcaa
tcaagaactggaaaactattttagcggtctgggttgggaaccgctgtttgttgaaggtgacgatccgaaactgatgcatccgctgatggcaaa
aaaactggatgaagccattgagaagattcagatgattcaggcaagcgcacgtaaacataaagcaagcgaagcaacccgtccggtttggcc
gatgctgattgttcgtaccccgaaaggttggacaggtcctaaagattggaatggcgaagttgtggaaggtagctttcgtgcacatcaggttcc
gattccggtgaatgccctgaatatgacccatatcgataaactggaagcatggctgaccagctatcatccggaagaactgtttgataaaaacg
gcaaaatcctggaagaaattcgtgccctggcaccgaaaggcctgaaacgtatggcagttcatccgattaccaatggtggtattaatccgcgt
accctgaaactgagcagctgggaaaaatttgccaccaaatttgaaaccccctggccagattaaaggtcaggatatgatcgaactgggcaaat
atttcgcagaaattatcaccctgaacaaggataactttcgcatttttggtccggatgaaaccaaatccaatcgtatgaatgccgtgtttaatgtga
ccaaacgtcagtggctggaaaaaatcgcaccgacctatgatgaatggatgagtccggaaggtcgtgttattgatagccagctgagcgaaca
tcaggcagaaggttttctggaaggttatgttattaccggtcgccatggtgtttttgcaagctatgaagcatttctgcgtgttgtggatagtatgct
gacccagcatatgaaatggatgaagaaaagcctggaactgccgtggcgtaaagattttccgagcctgaatgtgattgcgaccagcaccgc
atttcagcaggatcataatggttatacccatcaggatccgggtctgctgggtcatctggcagataaacgtccggaactgattcgtgaatatctg
cctgcagataccaattgcctgctggcaaccatggaaaaagcactgaaagatcgtaatgtgatcaacctgattgtggcaagcaaacagcctc
gtgaacagttttatagcgttgaagaagccagcgaactggtacagaaaggctataaaatcattaattgggccagcaacgtgagcaaaaatga
agaaccggatgttgtgtttgcagcagccggtgttgaaccgaatctggaagctctggcagccattagtattctgaacaaagaattcccgaacct
gaaaatccgttttgtgaatgttctggatctgctgaagctgaaaagcccgaaacatgatccgcgtggcattagcgacgaagaatttgatcagat
cttcaccaaaaacaaaccgatcatctttgccttcatggttatgaaggcctgctgcgtgatatctttttgatcgccataaccataacctgatcacc
catggctatcgtgaaaatggcgatatcaccaccagttttgatattcgtcagctgagtcatatggatcgctttcatattgcaaaagatgcagcaat
tgcagccctgggtaaagatggcgaaatgtttgcgaaaaaaatggacagcaaactgcaagaacataccagttatgttcgcgagtatggctat
gatctgccggaagttgttaattggaaatggaccaatctgaaaccgattaaa **(SEQ ID NO:77)**

Nucleic acid sequence encoding for a phosphoketolase enzyme from *Streptococcus agalactiae NEM316*

atgagcgagttcgacaccaaaagctatctggaaaaactggatgcatggtggcgtgcagcaaactatattagcgcagcacagatgtatctga
aagataatccgctgctgcgtcgtgaactggttgaaaatgacctgaaagttcatccgattggtcattggggcaccgttccgggtcagaattttat
ctatgcacatctgaatcgtgccatcaacaaatatgatctggacatgttttatatcgaaggtcctggtcatggtggtcaggttatggttagcaata

gttatctggatggtagctataccgaactgaatccgaatattgaacagaccgaagatggttttaaacagctgtgcaaaatctttagctttccgggt
ggtattgcaagccatgcagcaccggaaacaccgggtagcattcatgaaggtggcgaactgggttatgcactgagccatgccaccggtgca
attctggataacccggatgttattgcagcaaccgttattggtgatggtgaaggcgaaaccggtccgctgatggcaggttggctgagcaatac
ctttattaacccggttaatgatggtgcagttctgccgatcttttatctgaatggcggtaaaattcataatccgaccatctttgaacgcaaaaccga
tgaagaactgtcccagttttttgaaggtctgggttggaaaccgatttttgcagatgttgttgaactgagtgaagatcatgcagccgcacatgca
ctgtttgcagaaaaattagatcaggccatccaagagattaaaaccattcagagcgaagcacgtcagaaaccggcagaagaagcaattcag
gcaaaatttccggttctggttgcacgtattccgaaaggttggacaggtccgaaagcatgggaaggcaccccgattgaaggcggttttcgtgc
acatcaggttccgattccggttgatgcccatcatatggaacatgttgatagcctgctgagctggctgcagagctatcgtccggaagaattattt
gatgaaagcggcaaaatcgtggatgaaattgcagccattagcccgaaaggcgatcgtcgtatgagcatgaacccgattaccaatgcaggt
attgttaaagcaatggataccgcagattggaaaaaattcgccctggatattaatgtgccaggccagattatggcacaggatatgattgaatttg
gcaaatatgcagcggatctggtggatgcaaatccggataattttcgtatttttggtccggatgaaacgaaaagcaatcgtctgcaagaagttttt
acccgtaccagccgtcagtggctgggtcgtcgtaaaccggattatgatgaagcactgagtccggcaggtcgtgttattgattcacagctgag
cgaacatcaggcagaaggttttctggaaggttatgttctgaccggtcgtcatggttttttgcaagctatgaaagctttctgcgtgttgtggatag
tatggttacccagcactttaaatggctgcgtaaaagcaaaacccataccacctggcgtaaaaactatccggcactgaatctgattgccgcaa
gcaccgtttttcagcaggatcataatggttatacccatcaggatccgggtattctgacccatctggccgaaaaaactccggaatatattcgtga
atatctgcctgcagataccaatagtctgctggcagttatggataaagcatttaaagccgaggacaagattaacctgattgtgaccagcaaaca
tccgcgtccgcagttttatagcattgcagaagccgaagaacttgttgccgaaggctataaagtgattgattgggcaagcaatgttagcctgaa
tcaagaaccggatgtggtttttgccgcagcaggcacagaaccgaatctggaagccctggcagcaattagcattctgcacaaagcctttccg
gaactgaaaattcgttttgtgaatgtgctggacattctgaaactgcgtcatccgagccaggatgcacgtggtctgagcgacgaagaatttgat
aaagtgtttaccaccgataagccggtgatctttgcatttcattcctacgaagatatgatccgcgatatctttttttagccgtcataatcacaatctgc
atacccatggttatcgcgaaaatggtgatattaccaccccgtttgatatgcgtgttatgtcagaactggatcgttttcatctggcgcaggatgcc
gcactggcaagcctgggtaatgaagcccaggcatttagtgatgaaatgaatcagatggtggcctatcacaaagattatatccgtgaacatgg
tgatgatattccggaagttcagaattggaaatgggaaaacattaaa **(SEQ ID NO:78)**

Nucleic acid sequence encoding for a phosphoketolase enzyme from *Mycoplasma agalactiae PG2*

atgaaaaaaagccatgattttgatagcaaagaatatctgaatctggttgatgcatggtggcgtgcagcaaattatctgagcgttggtcagatgt
atctgcgtaataatccgctgctgaaaattccgctgaccagcaatgatgttaaaatctatccgattggtcattggggcaccgttccgggtcagaa
ttttatctatgcacatctgaaccgcattatcaacaaatacgatctgaatatgttttttatcagcggtcctggtcatggtggtcaggttattgcaagc
aatacctatctggatggtagctataccgaactgtttccgcatgttaccaaagatattaaaggtatgacccacctgttcaaatactttagctttccg
ggtggcaccgcaagccatgcagcaccggaatgtccgggtagcattcatgaaggtggtgaactgggttatagcctgagtcatgcagccggt
gcagttctggataatccggatgttattgccgcaaccgttattggtgatggtgaaagcgaaaccggtccgctgagcgcaggttggtttattaac
agctttatcaatccggcaaatgatggtgccgttctgccgattctgcatgttaatggtggtaaaattagcaacccgaccatttggagccgtcgta
gcaatgaagaactggttagctattttaccggtgccggttggaaaccgtttattgttgaaggtaatgagccggaatatatgcatcatgaaatggc
aaaagcactggatgcaagcgttgaactgattaaacagtatcaggccgaagcacgtaaaaatggtgcaaataaagcaaaacgtccgcagtg
gccgatgattgttctgaaaagcccgaaaggttggacaggtccgaaagaatggaatcatgaagcaattgaaggttcctttcgtgcacatcagg
ttccggttccagttagcgcagaaaaaatgcagcatattgatgcactggaaaattggctgcgtagctatcgtccggaagaacttttgatgaaaa
tgcccagctgaaaccggaaattgcagcaattgcaccgaaaggcgatcgtcgtatgggtaaaaacccgattgcaaatggtggcattaatccg
cgtgcaattaatgttggtgattggaccaaatttgccctggatatcaaacagcctggcaaagttattaatcaggatatggttaccctgggcagct
atctgggcgaactgagcctgctgaataaagataatttcgtgtttggggtccggatgaacataaaagcaatcgtctgtatgagatgttcaaagt
taccgatcgtcagtggctggatcgtatcgatgaaaaatatgatgaatttctgagcagcgtgggtcgcattattgatagccagctgagcgaaca
tcaggcagaaggtatgctggaaggttatgttctgaccggtcgccatggtgttttgcaagctatgaaagctttctgcgtgttgtggatagcatgc
tgacccaacatatgaagtgggttaaaaaagcgctggacattccgtggcgtaatgattatccgagcctgaatgtgattgcaaccagtaatgcat
ttcagcaggatcataatggttatacccatcaggatcctggtctgattggccatctggcagataaacgtccagaactgatccgtgaatatttacc
ggcagataccaataccctgctggcaaccatggccaaagccctgcaggatcgtaacgtgattaatctgattatcagcagtaaacagccacgc
catcagtttttagtattgaagaagcaaccgagctggtcgaaaaaggcattaaaatcattgattgggccagcaacattaagccgaacgaaga
accggatctggtggttgcagccagcggtacagaaagcaccattgaaagcctggccaccattacctacctgcgtgcccatttccggaactg

aaaatccgttttgttaatgtgctggatctgctgaagctgcgtcatccgagtattgatcctcgtggtctgagcgatagcgaatttgatagtatcttc
acgaaagacaaaccgatcctgtttgcctttcatggttatgaagccattctgcgcgatatctttttcctgcgttcaaaccataacattatcacccat
ggctatcgtgaaaatggcgatattaccaccgcatttgatattcgtctgctgagtgaaatggatcgctttcatatgaccgcaaatgttgcaaaaaa
actggcaccggttgttggcgaaagcaaagcaaatgaactggtgaaactgatggaagataaaatcaaagaacaccgtgcctatatcaaaga
gtatggcaccgatctgccggaagttaaagaatgggaatggaccccgtataaa **(SEQ ID NO:79)**

Nucleic acid sequence encoding for a phosphoketolase enzyme from *Streptococcus gordonii str. Challis substr. CH1*

atgaccaccgactataacagcaaagcctatctggaaaaagttgatgcatggtggcgtgcagcaaactatattagcgcagcacagatgtatct
gaaagataatccgctgctgaaacgtgatgttgttgcaaatgacctgaaagcacatccgattggtcattggggcaccgttccgggtcagaattt
tatctatgcacatctgaatcgcaccatcaacaaatatgatctggacatgttttatatcgaaggtcctggtcatggtggtcaggttatggttagcaa
tagttatctggatggtagctataccgaactgaatccgaatattccgcagaatgaagagggttttaaacacctgtgtaaaatctttagctttccgg
gtggtattgcaagccatgcagcaccggaaacaccgggtagcattcatgaaggtggtgaactgggttatgcactgagtcatgcagccggtg
caattctggataacccggatgttattgcagcaaccgttattggtgatggtgaaggcgaaaccggtccgctgatggcaggttggctgagcaat
acctttattaacccggttaatgatggtgccattctgccgatcttttatctgaatggcggtaaaattcataatccgaccatctttgaacgcaaaacc
gatgaagaactgaccctgtttttgaaggtctgggttggaaaccgatttttgcagatgttaccgcaattagcgaaaatcatgaagcagcacatg
cactgtttgcagccaaactggatgaagcaattgaagagatcaaaaaagttcaggcagaagcacgtaaaggtagcgcagaagaagcaacc
caggcaatttttccggttctggttgcacgtattccgaaaggttggacaggtccgaaaagctgggaaggcaccccgattgaaggcggttttcg
tgcacatcaggttccgattccggttgatgcccatcatatggaacatgttgacgcactgctgaattggctgaaaagctatcgtccggaagaactt
tttgatgaaagcggtaaagttctgccggaaattgccgcaattggtcctaaaggtgatcgtcgtatggcaatgaacccgattaccaatgccggt
gttattaaacctatggataccgcagattggaaaaaacacgcactgaaatttggcactccgggtgaaattgttgcacaggatatgatcgaattc
ggtaaatatgcaaccgatctggtggatgcaaatccggataattttcgtatttttggtccggacgaaaccaaaagtaatcgtctgcaagaagtttt
tacccgtaccagccgtcagtggctgggtcgtatgcgtcctgaatatgatgaagccctgagtccggcaggtcgtgttattgatagccagctga
gcgaacatcaggccgaaggtatgctggaaggttatgttctgaccggtcgtcatggttttttgcaagctatgaaagctttctgcgtgttgtggat
agcatggttacccagcactttaaatggctgcgtaaatgtaaaacccataccacctggcgtaaaaactatccggcactgaatctgattgcaacc
agcaccgtttttcagcaggatcataatggttatacccatcaggatccgggtattctgacccatctggcagaaaaaactccggaatttatccgtg
aatatctgcctgcagataccaatagcctgctggcagttatggataaagcatttaaagccgaggataaggtgaacctgattgtgaccagtaaac
atccgcgtccgcagttttatagtgccgaagaagcggaggaactggttcgtgaaggctataaagtgattgattgggcaagcaccgtgagcaa
caacgaagaaccggatgtggtttttgccgcagcaggcacagaaccgaatctggaagcactggcagcagttagcattctgcacaaagccttt
ccggaactgaaaattcgttttgtgaatgtggtggacattctgaaactgcgtcatccgagcgttgatgcgcgtggtctgagcgacgaagaattt
gatcaggtgtttaccaccgataaaccggttatctttgcctttcatggttatgaaggcatgatccgcgatatctttttttaaccgccataaccataatc
tgcgcgttcatggctatcgtgaaaatggtgatattaccaccccgtttgatatgcgtgttatgtcagaactggatcgttttcatctggcccaggatg
ccgcaaatgcagccctgggtgaagatgcagcggtttttagcgcaaaaatggatgaaaccgttgcatatcataacgcctatattcgcgaaaat
ggggatgatattccggaagttcagaattggaaatgggaaaacattaacaaa **(SEQ ID NO:80)**

Nucleic acid sequence encoding for a phosphoketolase enzyme from *Kingella oralis ATCC 51147*

atgcagaacacccagtttgacacaccggaatatctggcaaaagttgatgcatggtggcgtgcagcaaactatattagcgcagcacagatgt
atctgaaagataatccgctgctgaaaaaaccgctgaccgcaaatgatgttaaagcacatccgattggtcattggggcaccgttccgggtcag
aattttatctatgcacatctgaatcgtgccatcaacaaatatgatgtggacatgttttatatcgaaggtcctggtcatggtggtcaggttatggtta
gcaatagctatctggatcatagctataccgatatctatccggaaattacccaggatgaagcaggtctgaaaaagctgtgtaaaatctttagcttt
ccgggtggtattgcaagccatgcagcaccggaaacaccgggtagcattcatgaaggtggtgaactgggttatgcactgagccatgcctttg
gtgcagttctggataacccgaacattattgcagcagcagttattggtgatggtgaagcagaaaccggtccgctgtgtgcaggttggtttggta
ataccttattaacccggttaatgatggtgccgtgctgccgattctgtacctgaatggtggtaaaattcataatccgaccattctggcacgtaaa
accgatgccgaactgacccagtattttaacggtatgggttgggaaccgatttttgttgaagttagcgatccggcacatagccatgcgattatgg
cacagaaactggatgaggcagttgaacgtattctggccatttggcaggatgcacgtagccgtagcgccaatgatgcaaccatgcctcgttg

gcctgttctggttgcccgtattccgaaaggttggacaggtccgaaaacctggaatggcgaaccgatcgaaggcggttttcgtgcacatcag
gttccgattccgaccaatagtcatgatatgagcaccgcagatgcactggaagcatggctgcgtagctatcgtccggaagaactgtttgatgat
aatggtcgtttcctggataaatggcgtgaaattagcccgaaaggcgcaaaacgtatgagcgttcatccgatcaccaatggcggtgttgcacc
gaaagcactggttatgccggattggaccaaacatgccctgaaaattggcacccctggtagccaggatgcccaggatatgattgaatgtggt
cgtctgatggcagatgttattaccgccaatccggataactttcgtatttttggtccggatgaaaccaaaagcaatcgtctgaatgaagtgttcaa
agtgaccaatcgtcagtggctgggtgttcgtgatgcagcctatgatgaatggattgcaccggttggtcgtgttattgatagccagctgagcga
acatcaggcagaaggttttctggaaggttatgttctgaccggtcgtcatggttttttgcaagctatgaaagctttctgcgtgttgtggatagcat
gattacacagcactttaagtggctgcgcaaatgcaaaacccatgcaccgtggcgtaaagattatccgagcctgaatctgattgcaaccagca
ccgtttttcagcaggatcataatggttatacccatcaggatccgggtctgctgacccatctggcagaaaaaaaacctgaatttgtgcgcgaat
atttaccggcagatgccaataccctgctggcagttatgagcgaagcactgaccagccgtgatcgtattaacctgattgttagcagtaaacatc
tgcgtccgcagttttatagcgcagatgaagccaaagaactggttcgtgaaggctataaaatcattgaatgggcaagcacctgtcatgacggt
gaaccggatgttgtgatcgcagcggcaggcaccgaaccgaatatggaagccctggcagcaattaatgttctgcacaaacattacccggaa
atgaaaatccgctttatcaacgtggtggatattctgaaactgcgtcatccgagcattgatccgcgtggtctgagtgatgaagcgtttgatgccc
tgtttacccgtgataaaccggttgtttttgctttcatggctatgagaatatggtgcgcgatatctttttccgcgtcataatcgtaatgtgcgcatcc
atggttatcgtgaaaatggtgatattaccaccccgtttgatatgcgtgttctgtcagaaatggatcgttttcatgttgcaaaagatgccgcacag
gcagtttatggtgagaaagcagcagattttgccaacaaaatggacgaaaccattcagtttcatcgtagctacattcgcgaacatggtaaagat
attccggaagttgcagaatggaaatggcagccgctggccaaa **(SEQ ID NO:81)**

Nucleic acid sequence encoding for a phosphoketolase enzyme from *Mycoplasma fermentans M64*

atgaacaaaaaagaatttgatagcaaagaatatctggaaaaggttgatgcatggtggcgtgcagcaaattatctgagcgttggtcagatttat
ctgcgtaataatccgctgctgaaacatccgctgaccagtgatgatgttaaagtttatccgattggtcattggggcaccattagcggtcagaattt
tgcatatgcacatctgaatcgcgtgatcaacaaatatgatctgaatatgttctacatcgaaggtccgggtcatggtggtcaggttatgaccagc
aatagctatctggatggtagctataccgaactgtttccgcatgttacccaggatgaagcaggtatgcagcacctgtttaaatactttagctttcc
gggtggcaccgcaagccatgccgcaccggaaacaccgggtagcattcatgaaggtggtgaactgggttatagcattagccatgcaaccg
gtgcaattctggataatccggatgttattgcagcaaccattgttggtgatggtgaagcagaaaccggtccgctggcgaccagctggtttagca
atagttttatcaatccggttaatgatggtgccgttctgccgattctgcatctgaacggtggtaaaattagcaatccgaccattctgagccgtaaa
agcaatgaagaactgcagcagtattttcgtggtatgggttgggaaccgcattttgttgaaggtgataaaccggaagtaatgcatgaactgatg
gcaaaaaccctggatagcgtgattgaagaaattcagagcattcagaccaaagcccgtaaaaaaccggcagataaagcaaaacgtccggtt
tggccgatgattgttctgcgtaccccgaaaggttggacaggtccgaaaagctggaataaagaagcaattgaaggtagctttcgtgcacatca
ggttccgctgccgatcaatgcagaaaatatggaacatgcagatgccctggaaaaatggctgcgtagctatcgtccggaagaacttttgata
aaaaaggcaaactggtgaaagagattgcagccattgcacctaaaggtaaacgtcgtatgggtatgaatccgattaccaatggtggcattaat
ccgaaagttatgaaactgggtgattggcgtaaatttgccctgcattttgatcgtcctggtagcgttgttgcacaggatatggttgagctgggca
cctattttgcagatctggttaaacgcaatccggaaaatttttcgtatttttggtccggacgaaaccaaaagtaatcgtctgtataacctgttcaaag
tgaccaatcgtcagtggatggaacgcattgatagtaaactggatgaggcactgagtccggttggtcgtattattgatagccagctgagcgaa
catcaggcacagggttttctggaaggttatgttctgaccggtcgtcatggcatttttgcaagctatgaaagctttctgcgtgttgtggatagcatg
gtgacccagcatatgaaatggttacgtaaagccaaagaaatcaactggcgcaaagattatccgtccctgaatattatggcaaccagcaccg
cctttcagcaggatcataatggttatacccatcaggatccgggtattatcggtcatatggcggataaacgtccagaactgattcgtgaatacct
gcctgcagataccaataccctgctggcagttatggataaagcctttaccgaacgcaatgtgattaatctgattgtgagcagcaaacagcctcg
ccatcagttttatagcgttgaagaagccgaaacgctggttgaaaaaggtctggatattatcgattgggcaagtacctgtagccgtaatgaaac
tccggatctggtggttgttgccagcggcaccgaaccgaatctggaagcactggccaccatttctattctgaacaaagaatacccgagcatga
aaatccgttttgtgaatgttgttgatctgctgaagctgcgtcatccgaaaattgatccgcgtggtctgagtgatgaagaattcgatgaaatcttta
ccaaagataagccggtgctgtttgcctttcatggttttgaaggcattctgcgcgatattttctttgatcgccataaccataacctgattgcacatg
gttatcgcgaaaatggtgatatcacaaccagctttgatattcgtcagctgtcacatatggatcgttttcacatggcaagtgatgcagcagcagc
cgtttttggtagctcaaaagcgaaagaattcatggacaaaatggaagaaaccattcagtttcacaacaagtatattcgcgaagtgggcaccg
atattccggaagtgaaaaattggaaatgggaaggcctgattaaa **(SEQ ID NO:82)**

Nucleic acid sequence encoding for a phosphoketolase enzyme from *Granulicatella adiacens ATCC 49175*

atgacccagtttgacacaccggaatatctggcaaaagttgatgcatggtggcgtgcagcaaactatattagcgttgcacagatgtatctgaaa
gataatccgctgctgcgtcgtccgattcagaaagaagatgttaaactgcatccgattggtcattggggcaccattgcaggtcagaattttatct
atgcacatctgaatcgtgccatcaacaaatatgatctggacatgttttatatcgaaggtccgggtcatggtggtcaggttatggttagcaatagc
tatctggatggtagctataccgaactgtatccgcagattacccaggatgaagcaggttttaaacagctgtgcaaaatctttagctttccgggtg
gtattgcaagccatgcagcaccggaaacaccgggtagcattcatgaaggtggtgaactgggttatagcctgagccatgccaccggtgcag
ttctggataacccgaatgttattgcagcagcagttattggtgatggtgaagcagaaaccggtccgctggcagcaggttggtttagtaatacctt
tattaacccggttaatgatggtgccgttctgccgattctgtacctgaatggcggtaaaattcataatccgaccattctggcacgtcgtaccgatg
aagaactgacacagttttttaacggtctgggttgggatccgatttttgttgaaggcaccgatccggaaaaagttcatccgctgatggcagcaa
aactggatgaggcaattgaaaaaattcaggccatccagaaagaggcacgcgcaaaatcagccgaagaggcaaccatgccgcattggcct
gttctggttgttcgtaccccgaaaggttggacaggtccgaaagaatggaatcatgaaccgattgaaggcggttttcgtgcacatcaggttccg
attccggttagcggtgaagccatggaacatgttgatgccctggttgattggctgaaaagctatcgtccggaagaacttttgatgaaaatggc
aaactggtggaagaaattgcagccattagccctaaaggtccgcgtcgtatgagtatgaatccgattaccaatgccggtgttgttaaaccgatg
gaaattaccgattggaccaaacatgcaatcgataccagcaaaccgggtgcaattcaaaaacaggatatgatcgaattcggcaaatttgcag
ccgatctggttaaagcaaatccggataattttcgcattttcggtccggatgaaaccaaaagtaatcgtctgaacgaagtgtttaaagccaccaa
tcgtcagtgggttggtcgtcgtgatgaaagctatgatgaatggattagtccggtgggtcgtgttattgatagccagctgagcgaacatcaggc
agaaggttttctggaaggttatgttctgaccggtcgtcatggttttttgccagctatgaaagttttctgcgtgttgtggatagcatgattacacag
cactttaaatggctgcgtaaagccaaaacccatgcaccgtggcgtaaaaactatccgagcctgaatctgattgcaaccagcaccgtttttcag
caggatcataatggttatacccatcaggatccgggtctgctgacccatctggcagaaaaaaaaccggaatttgtgcgtgaatatttaccggca
gataccaatagtctgatggccgttatggcagaagcactgagcagcgaagataaaatcaacctgattgtgagcagtaaacatccgcgtccgc
agttttatagcgttgaagaagcaaaagaactggtcagcgaaggctataaagtgattgattgggcaagcaccgtgaaagaaggtgaagaac
cggacgttgtgatcgcagcagccggtacagaaccgaatctggaagccctggcaggtattagcattctgcacaaacagtttccggaactgaa
aatccgttttatcaacgtggtggatattctgaaactgcgttcaccgaaagtggatccgcgtggtctgagcgacgaagaatttgataaactgttta
ccaccgataaaccggtggtgttttgttttcatggttatgaaggtatgatccgcgacctgtttttgatcgcaataaccataacgtgcatatccatg
gctatcgcgaaaatggtgatattaccaccccgtttgatatgcgtgttctgagtgaaatggatcgctttcatgttgcaaaagatgcagccgttgca
gtgtatggtgaaaaagcaagcgaatttgccgctaaaatggacgaaaccgttgaatttcatcacagctatattcgtgaacatggtgaggatattc
cggaagttgttagctggcagtgggaaaatgtgaacaaa **(SEQ ID NO:83)**

Nucleic acid sequence encoding for a phosphoketolase enzyme from *Mycoplasma hominis ATCC 23114*

atgattagcaaaatctatgatgataaaaagtatctggaaaaaatggataaatggtttcgcgcagcaaattatctgggtgtttgtcagatgtatctg
cgtgataatccgctgctgaaaaaaccgctgaccagcaatgatatcaaactgtatccgattggtcattggggcaccgttccgggtcagaatttt
atctatacccatctgaatcgcgtgatcaagaaatatgatctgaatatgttctacatcgaaggtcctggtcatggtggtcaggttatgattagtaat
agctatctggatggcagctatagcgaaatttatccggaaattagccaggatgaagcaggtctggccaaaatgtttaaacgttttagctttccgg
gtggcaccgcaagccatgcagcaccggaaacaccgggtagcattcatgaaggtggtgaactgggttatagcattagccatggcaccggt
gcaattctggataacccggatgttatttgtgcagcagttgttggtgatggtgaagcagaaaccggtccgctggcgaccagctggtttagcaat
gcctttattaacccggttaatgatggtgccattctgccgattctgcatctgaacggtggtaaaattagcaatccgaccctgctgagccgtaaac
cgaaagaagaaatcaaaaaatactttgaaggcctgggctggaatccgatttttgttgaatggtcagaagataagagcaacctggatatgcat
gaactgatggcaaaaagcctggataaagccattgaaagcatcaaagaaattcaggcagaagcacgtaaaaaacctgcagaagaagcaac
ccgtccgacctggccgatgattgttctgcgtaccccgaaaggttggacaggtccgaaacagtggaataatgaagcaattgaaggtagctttc
gtgcacatcaggttccgattccggttagcgcctttaaaatggaaaagattgccgatcttgagaaatggctgaaaagctacaaaccggaagaa
ctgtttgatgaaaatggcacgatcataaaagaaatccgtgatctggctccggaaggtctgaaacgtatggcagttaacccgattaccaatggt
ggtattgatagcaaacctctgaaactgcaggattggaaaaagtacgcactgaaaattgattatccgggtgaaattaaagcacaggatatggc
cgaaatggccaaatttgcagcagatatcatgaaagataaccctagcagctttcgcgtttttggtccggatgaaaccaaaagcaatcgtatgttt
gccctgtttaatgtgaccaatcgtcagtggctggaaccggttagtaagaaatacgatgaatggattagtccggcaggtcgcattattgattcac

agctgagcgaacatcagtgtgaaggttttctggaaggttatgttctgaccggtcgtcatggtttttttgcaagctatgaagcatttctgcgtgttgt
ggatagcatgctgacccaacatatgaaatggatcaaaaaggcaagcgaactgagctggcgtaaaacctatccgagcctgaacattattgca
accagtaatgcatttcagcaggatcataatggttatacgcatcaggatccgggtctgctgggtcatctggcagataaacgtccagaaattatc
cgtgaatatctgcctgcagataccaatagcctgctggcggttatgaataaagcactgaccgaacgtaatgtgattaatctgattgttgcaagca
aacagcctcgcgaacagttttttaccgttgaagatgcagaggaactgctggaaaagggttataaagttgttccgtgggcaagcaatattagc
gaaaatgaagaaccggatattgtgtttgccagcagcggtgttgaaccgaatatcgaaagtctggcagcaattagcctgatcaatcaagaata
tcctcatctgaaaatccgctatgtgtatgtgctggatctgctgaagctgcgtagtcgtaaaatcgatccgcgtggtattagtgatgaagagtttg
ataaagtgtttaccaaaaacaaaccgattatctttgcctttcatggctttgagggactgctgcgcgatattttctttacccgtagcaaccataacct
gattgcacatggttatcgtgaaaacggtgatatcacaaccagctttgatattcgtcagctgagtgagatggatcgttatcatattgcaaaagatg
ctgccgaagccgtgtatggtaaagatgcaaaagcatttatgaacaaactggatcagaaactggaataccaccgcaactatatcgatgagtat
ggctatgatatgccggaagttgtggaatggaaatggaagaacatcaataaagaaaat **(SEQ ID NO:84)**

Nucleic acid sequence encoding for a phosphoketolase enzyme from *Mycoplasma crocodyli MP145*

atgaaaaaaaccgtgtatgataccgaactgtatattgagaaactggatgcatggtttcgtgcagcaaattatctgagcgttggtcagatgtatct
gcgtaataatccgctgctgcgtaacaaaattaccaaagatgatgtgaaagtgtatccgattggtcattggggcaccattccgggtcagaatttt
gcatatgcacatctgaatcgcgtgatcaacaaatatgatctgaatatgttctacatcgaaggtcctggtcatggtggtcaggttatgaccagca
atagctatctggatggtagctatacagaactgtttccgcatgttacccaggatctggacggtatgaaacacctgtttaaatactttagctttccgg
gtggcaccgcaagccatgcagcaccggaaacaccgggtagcattcatgaaggtggtgaactgggttatagcctgagccatgccaccggt
gcaattctggataatccgaatgttattgcagcaaccattgttggtgatggtgaaagcgaaaccggtccgctggcagcaggttggtttagcaat
agttttatcaatccggttaatgatggtgccgttctgccgattctgcatctgaacggtggtaaaattagcaatccgaccattctgtgtcgcaaaag
caatgaagaactgaccaactattttctgggtatgggttgggaagccatttttgttgaaggtgaagatgtgcagaaaatgcataaactgatggca
accaaactggactatgccattgaacgtattctgagcattcagaaagaagcccgtaaaggtaaagcagaagaggccacccgtccgctgtgg
ccgatgattgttctgcgtaccccgaaaggttggacaggtccgcagaaatggaatagcgatcagattgtgggtagctttcgtgcccatcaggtt
ccgattccggtgaatagtgaaaatatgacccatattgatgccctggttgattggctgaaaagctataatgttgataacctgttcgataaaaagg
gcaaactggttccggaaattgccgaaatcgcaccggtgggtgatcgtcgtatgggtatgaatccggtgaccaatggtggcctgaatccgcg
taatctggcactgccgaattggcaggattttgcactgaatctggaaaaacctggtgcaaaaattgcacaggatatggttgagctgggttcctat
tttgcaaaagtgatggaaatgaataaagataattttcgcctgttcggtccggatgaaaccaaaagtaatcgtctgtttaacgtgttcaaagttac
cagccgtcagtggctggaaccgattaacccgctgtttgatgaagcactgagtccggcaggtcgtgttattgatagccagctgagcgaacatc
aggcagaaggttttctggaaggttatgttctgaccggtcgccatggtgtttttgcaagctatgaaagctttctgcgtgttgtggatagcatgctg
acccagcatatgaaatggctgaagaaagcaaatgatgttagctggcgtaatgattatccgagcctgaatgtgattgcgaccagcaccgcatt
tcagcaggatcataatggttatacacatcaggatccgggtctgattggccatctggcagataaaactccggaactgattcgtcagtatctgcct
gcagataccaataccctgctggcagttatggataaaagcctgaccgaacgtaacgtgattaaccatatcattgcaagcaaacagcctcgcg
aacagttttatagcgcaaaagaagcagcagaactggttgaaaaaggtctgaaagtgattaaatgggcaagcaccgtggaaggtaatgatga
accggatctggttgttgcagcagcaggcaccgaaccgaacctggaagccctggcagccattacgattctgaacaaagaatttccgaaactg
aaaattcgcttcgtgaatgtggttgacctgatgaaactgcgtcatccgagcattgatccgcgtggtattaccgataaagaattcgacaaaatctt
tacgaaagacaagccggttctgtttgcctttcatggttatgaaggtatcctgcgcgatatctttttcaaacgcaataaccataacctgatcgcac
atggctatcgtgaaaatggtgatatcacaaccagctttgatattcgccagctgtcacatatggatcgttttcatatggcagcaagcgcagcagt
tgcagcgctgggcaaaaaagccaatgcatttgaaacaaaaatgctggaaaccatcgattttcacaccaaatatatccgcgaatacggcacc
gatattccggaagttaaagaatggaagtggaatcctctggttcgcaaa **(SEQ ID NO:85)**

Nucleic acid sequence encoding for a phosphoketolase enzyme from *Neisseria sp. oral taxon 014 str. F0314*

atgagcgcacagtatgatagcgcagattatctgaataaagttgatgcatggtggcgtgcagcaaactatattagcgttgcacagatgtacctg
aaagataatccgctgctgatgcgtccgattcaggcaagtgatgttaaagcacatccgattggtcattggggcaccattgcaggtcagaatttt
atctatgcacatctgaatcgtgccatcaacaaatatgatctgaacatgttctatatcgaaggtccgggtcatggtggtcaggttatggttagcaa

tagctatctggatggtagctatagcgaaatctatccgaatattacccaggatgaagcaggtctgaaacagctgtgtaaaatctttagctttccg
ggtggtattgcaagccatgcagcaccggaaacaccgggtagcattcatgaaggtggtgaactgggttatgcactgagccatgccgttggtg
cagttctggataacccggatgttattgcagcaaccgttattggtgatggtgaagcagaaaccggtccgctgagcgcaggttggtttagcaat
gtttttatcaatccggttaatgatggtgccgtgctgccgattctgtatctgaacggtggtaaaattcataacccgaccattctggcacgtaaaagt
gatgaaagcctgcgtctgtattttgaaggtctgggttgggatccgatttttgttgaagccaccgattatgcaaccacccataaagttatggcaca
gaaactggatgaggccatcgaaaaaatcaaagccattcagaccaaagcacgtgcaggtaaagccgaagaggcagttatgccgaaatggc
ctgttctggttgcacgtctgccgaaaggttggacaggtccgaaagtgtggaatggtgaaccgattgaaggcggttttcgtgcacatcaggttc
ctattccggcaagcagccatgatatggccaccgttgatagcctggttgaatggctgaaaagctatcgtccggaagaactgtttgatgcaaatg
gcacctttaaagcagaactgcgtgaaattagcccgaaaggcgatcgtcgtatgagcaccaatccgattaccaatggtggcattaatccgcgt
cctctgaataccgcagattggaaaaaattcgcactggataatagcgatcgtggtagtattatggcccaggatatgattgaatttggcaaatatg
cagccgaactggttaaagcgaatccggataattttcgtattttcggtccggatgaaaccaaaagcaatcgtatgaacgaagtgttcaaagtga
ccaatcgtcagtggctggaaccgatcgataaagcatatgatgaatggatgagtccggcaggtcgtgttattgatagtcagctgagcgaacat
caggcagaaggttttctggaaggttatgttctgaccggtcgtcatggttttttgcaagctatgaaagctttctgcgtgttgtggatagcatggca
acccagcactttaaatggctgcgtaaatgtaaaacccatgcaccgtggcgtaaatcatatccgtcactgaatctgattgcaaccagcaccgttt
ttcagcaggatcataatggttatacccatcaggatccgggtatgctgacccatctggcagaaaaaaaaccggaatttatccgtgaatatctgc
ctgcagatgccaatagcctgctggccgttatgagcgaagttctgagcagcaaagataaagtgaacctgatcgttagcagtaaacatcctcgt
ccgcagttttatagtgcagcagaagcggaagaattagttcgtgaaggttacaaagttatcgattgggcaagcaccgataaaggtggcgaac
cggatgtggttattgccgcagccgcaacagaaccgaatctggaagcactggcagcaattacaattctgaacaaacagtttccggaactgaa
aatccgctttattaacgtggtggatattctgaaactgcgtcatcctaaagtggatccgcgtggtctgaccgatgaacagttcgatgcactgttta
ccaaagacaaaccggtgatttttgctttcatggctatgaaggtatggtgcgcgatatctttttgatcgccataaccataatctgcgcatccatg
gttatcgtgaaaatggtgatattaccaccccgtttgatatgcgtgttctgagtgaaatggatcgttttcatgttgcaaaagatgcagccctggca
gtttatggtgacaaagcacaggattttgccaaaaaaaatggacgataccctggcatttcatcacagctatattcgcgaaaatggcgaagatattc
cggaagttcgtaattggaaatgggaagccctgaaa **(SEQ ID NO:86)**

Nucleic acid sequence encoding for a phosphoketolase enzyme from *Eremococcus coleocola ACS-139-V-Col8*

atgaccgtggactacaacagcaaagaatatctgaccctggttgataaatggtggcgtgcagcaaattatctgagcgttggtcagatgtttctg
cgtgataatccgctgctgcaagaagaggttaccgcagatcatgttaaactgaatccgattggtcattggggcaccattggtggccagaatttt
ctgtatgcacatctgaatcgcattatcaacaagtataatgtgaatatgttttatatcgaaggccctggtcatggtggtcaggttatggttaccaat
agctatctggatggtagctataccgaacgttatccggaatttacccaggatattgccggtatgaaaaaactgtttaaaaccttcagctttccggg
tggtattggtagccatgcagcaccggaaacaccgggtagcatgcatgaaggtggtgaactgggttatgcactgagccatgccaccggtgc
aattctggataacccggatgttattgcagcaaccgttgttggtgatggtgaagcagaaaccggtccgctggcagcaggttggtttagcaatgt
ttttatcaatccggtttcagatggtgcagttctgccgattctgtatctgaatggtggtaaaattgcaaacccgaccattctggcacgtaaaagca
atgaggatctgaccaaatatttcgaaggtatgggttggaaaccgtatattgttgaaggcaccgatccggaacaggttcatccgattatggcaa
aagttctggatgaagtgattgaagaaattcaggccattcaggcagaagcccgtaaaggtaaagccgaagatgcaaaaatgccgcattggc
cgatgatcctgtatcgtaccccgaaaggttggacaggtccggaagaagttgaaggtaaaacaattcagggtagctttcgtgcacatcaggtt
ccgattccggttagcggtcgtaatatggaagatattgatctgctgatcaactggctgaaaagctatggtcctgaagaactgttcaccgaaaat
ggcgaactggtagatgaactgaaagaatttgcaccgaaaggcgatcatcgtatggcaatgaacccgctgaccaatggcggtaatccgaaa
ccgctgaatatgccgaattggaaagattatgccctggaaattggcacccctggtagcaaagatgcacaggatatgattgaatttggtggttttg
cgcgtgatatcgtgaaagaaaatccggaaaacttcgcatttttggtccggatgaaaccaaaagtaatcgcctgaataaagtgtttgaagtga
ccaatcgtcagtggctggaaccgattagcgaaaaatttgatgaaaacatgtcagcaagcggtcgcgttattgatagccagctgagcgaacat
cagaatcagggttttctggaagcatatgttctgaccggtcgtcatggttttttgcaagctatgaaagctttttcgtacggtggatagcatgatta
cccagcactttaaatggattcgcaaaagcgcaaaacatagctggcgtaaaccttatcagagcctgaatctgattagcgcaagcaccgtttttc
agcaggatcataatggttatacccatcaggatccgggtctgctgacccatattggtgaaaaacacggtgaatatatgcgtgcatatctgcctg
cagataccaattcactgctggcagttatggataaagcatttcgcagcgaaaacgtgattaactatgttgtgaccagcaaacatccgcgtccgc
agttttttacagcagatgaagccgaggaactggttaatgaaggtctgaaagttatcgattgggccagtaccgttaaagataatgaagaaccg
gatgtggttattgccgcagccggtacagaaccgaattttgaagcaattgcagcgatttcctatctggttaaagcctttccggaactgaagattc

gttttgttaatgtggttgacctgtttcgtctgcgtagtccggaaattgatccgcgtggtctgagtgatgatgaattcgatgcaatcttcaccaaag
ataaaccggtgtttttttgcctttcatagctacgaaggcatgctgaaagacatctttttttacccgtcataaccataatctgtacgcccatggttatcg
tgagaatggtgaaattaccaccccgtttgatatgcgcgttctgaatgaactggatcgttttcatctgagtgcacatgttgcagatgttgtgtatgg
tgataaagcccgtgattatgttgccgaaatgaaagggaaagttcaagaacatcgtgattacgtggaagaatatggtgccgatatgccggaag
tagaagattggaaatgggaggatatcaaa **(SEQ ID NO:87)**

Nucleic acid sequence encoding for a phosphoketolase enzyme from *Aerococcus urinae ACS-120-V-Col10a*

atgaccgactttgacagcaaagcctatctggataaagttgatgcatggtggcgtgcagcaaattatctgagcgttggtcagatgtatctgcgt
gataatccgctgctggatcgtgaagttaccgcagatgatatcaaaattaccccgattggtcattggggcaccattgcaggtcagaattttgttta
tgcacatctgaatcgcgtgatcaacaaatatgatctgaatatgttctacatcgaaggtccgggtcatggtggtcaggttatgcaggcaaatgc
atacctggatggcacctggaccgaacattatccggaatatccgcagaataaagaaggcatgcagaagttcttcaaatatttcagctttccggg
tggcaccggtagccatgcaaccgcagaaattccgggtagcattcatgaaggtggtgaactgggttatagcctgagtcatgccaccggtgca
attctggacaatccggatgttattgcagcaaccgttattggtgatggtgaaagcgaaaccggtccgctggcagcaagctggctgagcaata
gctttattaacccggttaccgatggtgcagttctgccgattctgtatctgaatggtggtaaaattgcaaacccgaccattctggaacgtaaaag
caatgaagatctgattaaatactttcagggtctgggttgggatccgatggttgttgaaggtaatgatccggaaaaagttcatccgctgatggca
aaaaccctggatcaggcaattgaaaaaatcaaaagcattcagggtgaagcccgtaaaggtagtgcagatgaagcaaccatgggccattgg
ccgatgatcctgtatcgtaccccgaaaggttggacaggtccgaaagcatgggaaggcaatgatattgaaggttcatttcgtgcacatcaggt
tccgattccggttaatgcagaaaatatggaacatgtggatgccctgattgattggctgaaaagctatcgtccggaagaactgtttaccgaaga
aggtcagctgcgtcctgaaattgccgaaattgcaccgaaaggcgatcagcgtatggcaagcaatccgattacagatggtggcattgatccg
aaaccgctggacctgccggattggcgtgattatgcactggattttgaaacaccgggtgaacgtgatgcacaggatatgattgaaatgggtgg
ttatgccgcaggcgttatcgaaaaaaatcctgataactttcgcatcttcggtccggatgaaaccaaaagtaatcgtctgaacaaagtgttcaat
gtgaccaaacgtcagtggctggaaccgattaaagataactatgatgaatggatgagcccgagcggtcgtgttattgatagccagctgagcg
aacatcagatggaaggttttctggaagcatataccctgaccggtcgtcatggtttttttgcaagctatgaagcatttattcgtaccgtggatagc
atgattacccagcactttaaatggatgcgcgaagcaagcgagtataaatggcataaaccgtatcagagcctgaacctgattagcagcagca
ccgcatttcagcaggatcataatggttatacccatcaggatccgggtctgctgacccatctggcagaaaaaaaaggtgaatttgtgcgtgcat
atctgcctgcagataccaatagcctgctggcagttatggacaaagcactgagcagcgaaaatgtgattaactatattgtgaccagcaaacat
ccgcgtccgcagttttttagcgttgaagaagcagaagagttcgtcgataaaggctataaagttatcgattgggcaagcaccgtggaagagg
gcgaagaaccggatgtggtgattgcagccagcggcaccgaaccgaccgttgaaaccattgccaccattagctatctgcatgaagcctttcc
ggaactgaaaattcgttatgttaatgtggtggatctgtatcgcctgcgtcatccgaatatcgatccgcgtggtctgagtgatgaagaatttgatg
ccgttttcaccaaagataaaccggtgtttttttggctttcatagctttgaaggcctgctgaaagatatcttctttgatcgccataaccataacctgtat
ccgcatggttatcgtgaggaaggtgccattaccaccccgtttgatatgcgtgttctgaatgaactggatcgctttcattttgcagcacatgttgc
cgaagttgtgtatggtgataaagcccaggattttatcgatcagatgaatgccaaagtggaagaacatcgtgcgtatattgttgaatatggcacc
gatatgccggaagtgaaagaatggaaatggcagccgctggaaaaa **(SEQ ID NO:88)**

Nucleic acid sequence encoding for a phosphoketolase enzyme from *Kingella kingae ATCC 23330*

atgaccaacaaaacccagttcgacacaccggaatatctgggtaaagttgatgcatggtggcgtgcagcaaactatattagcgttgcacagat
gtatctgaaagataatccgctgctgaaaacaccgctggttgcaaatgatgttaaagcacatccgattggtcattggggcaccgttccgggtca
gaattttatctatgcacatctgaatcgtgccatcaacaaatatgatgtggacatgttttatatcgaaggtcctggtcatggtggtcaggttatggtt
agcaatagctatctggatggtagctataccgaaatctatccggatattacccaggataccgcaggtctgaaaaaactgtgtaaaatctttagct
ttccgggtggtattgcaagccatgcagcaccggaaacaccgggtagcattcatgaaggtggtgaactgggttatgcactgagccatgccttt
ggtgcagttctggataacccgaatgttattgcagcagcagttattggtgatggtgaagcagaaaccggtccgctgtgtgcaggttggtttggt
aataccttattaacccggttaatgatggtgccgtgctgccgattctgtacctgaatggtggtaaaattcataatccgaccattctggcacgtaa
aaccgatgaagaactgaaacagtattttaacggtatgggttgggaaccgatttttgtggatgttaacaacgtggataactatcacgaaattatg
agccagaaagtggatgaagccgttgaacatattctgagcatttggcagaccgcacgtacccagaaagccgaagatgcaaccatgccgcat

tggcctgttctggttgcccgtattccgaaaggttggacaggtccgaaaacctggcatggcgaaccgatcgaaggcggttttcgtgcacatca
ggttccgattccggcaagcagccatgatatggaaaccgcaggcgaactggaaaaatggctgcgtagctatcgtccggaagaacttttgat
gataatggttgcttcctggataagtggcgtgatattagcccgaaaggcgcaaaacgtatgagcgttcatccgatcaccaatggtggcattaat
ccgaaagcactggttatgccggattggacccagcatgcactggaaattggtgttccaggtagccaggatgcacaggatatggttgaatgtg
gtcgtctgatggcagatgttgttaccgcaaatccgaataactttcgtatttttggtccggacgaaaccaaaagcaatcgtctgaatcaggttttc
aggttaccaaacgtcagtggctgggtcgccgtgatgaagcatatgatgaatggattgcaccggttggtcgtgttattgatagccagctgagc
gaacatcaggcagaaggttttctggaaggttatgttctgaccggtcgtcatggttttttgcaagctatgaaagctttttcgtgtggtggatagc
atgattacgcagcactttaaatggcttcgcaaatgtaaaacccacgcagcatggcgtaatgattatccgagcctgaatctgattgcaaccagc
accgtgtttcagcaggatcataatggctatacccatcaggatccgggtctgctgacccatctggcagaaaaaaaaccggaatttgtgcgtga
atatttaccggcagatagcaataccctgatggccgttatgagcgaagcactgaccagccgtgatcgtattaacctgattgttagcagtaaaca
tctgcgtccgcagtttttcaatgcagaagaagcaaaagaactggttcgcgaaggctataaagtgattgattgggcaagcacctgtcatgacg
gtgaaccggatgttgtgatcgcagccgcaggcaccgaaccgaatatggaagccctggcagcaattagcattctgcacaaacagtttccgg
aactgaagattcgttttatcaacgttgtggatatcctgaaactgcgtcatccgagcattgatccgcgtggtctgagtgatgaacagtttgatgca
ctgtttacccaagaaaaacctgtggtgttttgctttcatggttatgaaggtatgattcgcgacctgtttttttccgcgtgcaaaccataatgttcgtat
tcatggctatcgcgaaaatggcgatattacaaccccgtttgatatgcgtgttctgtcagaaatggatcgttttcatgttgccaaagatgccgcac
aggcagtttatggtgataaagcaagcgaattcgccaaaaaaatgggtgaaaccgttgcatttcatcgttcctatattcgtgaacatggcaccg
atattccggaagttgcagaatggaaatggcagccgctggccaaa **(SEQ ID NO:89)**

Nucleic acid sequence encoding for a phosphoketolase enzyme from *Streptococcus criceti HS-6*

atgaataccaacttcgatagcagcgattacctgaataaagttgatgcatggtggcgtgcagcaaactatattagcgcagcacagatgtatctg
aaagataatccgctgctgcgtcgtgaagttgcagcagaagatctgaaaagccatccgattggtcattggggcaccgttccgggtcagaattt
tatctatgcacatctgctgcgctccatcaacaaatatgatctggatatgttctatatcgaaggtcctggtcatggtggtcaggttatggttagcaa
tagctatctggatggtagctataccgaactgaatccgcagattagccagaccgaagagggtctgaaacagctgtgtaaaatctttagctttcc
gggtggtattgcaagccatgcagcaccggaaacaccgggtagcattcatgaaggtggtgaactgggttatgcactgagccatgccaccgg
tgcagttctggataacccggatgttattgcagcaaccgttattggtgatggtgaaagcgaaaccggtccgctgatggcaggttggctgagca
atacctttattaacccggttaatgatggtgccgttctgccgattcattttctgaatggtggcaaaattcataatccgaccatctttgaacgtaaaag
cgacgatgaactgaaagccttttttaccggtctgggttggaaaccgatttttgcagatgttaccgcatttgcaagcgatcatgcagccgcacat
aaactgtttgcagccaaactggatgaagccattgaagaaattcgtaacattcaggcaaaagcccgtaaaggtagcgcagatgaagcaacc
atgcctgcatggcctgttattgttgcacgtattccgaaaggttggacaggtccgaaaagctggaaaggcaccccgattgaaggcggttggc
gtgcccatcaggttccgattccggttgatagccatcatatggaacatgttgatgccctgctggattggctgaaaagttatcagccggaagaac
tgttcgatgcagaaggtcatctgaaatcagaagtggcagccctgagcccgaaaggcaatcgtcgtatgagcatgaatccgattaccaatgc
cggtgttattaaaccgatggatacagccgattggaaaaaacgtgcatttgatattcagacccctggtgaaattgttgcccaggatatgattgaa
tttggcaaatatgccgcagatctggttgaagcaaatccggataattttcgtatttttggtccggatgaaagcaaaagcaatcgcctgaatgaag
tgtttaccaaaaccaatcgtcagtggatgggtcgtcgtgatccgagctatgatgaatggctgagtccggcaggtcgtgttattgatagtcagct
gagcgaacatcaggccgaaggttttctggaaggttatgttctgaccggtcgtcatggttttttgccagctatgaaagctttctgcgtgttgtgg
ataccatgattacccagcactttaaatggctgcgtaaaagtaaaacccataccacctggcgtaaaaactatccgagcctgaatctgattgcaa
ccagcaccgtttttcagcaggatcataatggttatacacatcaggatccgggtgtgctgacccatctgagtgaaaaaactccggaatatatcc
gtgaatatctgcctgcagataccaatagcctgctggcggttatggataaagcatttaaagatgaggacaaaattaacctgatcgtgaccagca
aacatccgcgtccgcagttttatagcgttgaagaagcaagcgaactggtcgaaaaaggctataaagtgattgattgggcaagcaccgtgca
ggcaaatgaagaaccggatgtggtttttgccgcagcaggcacagaaccgaatctggaagcactggcagcaattagcattctgcacaaaac
ctttccgagtctgaaaattcgttttgtgaacgtggtggatattctgaaactgcgtcatccggacctggatccgcgtggtctgtctgatgaagaat
ttgataaagtgttcacgaaagacaagccggtgatctttgcatttcatgcatatgaaggtatgatccgcgatatctttttcgtcgccataaccata
atctgcatgtgcatggttatcgcgaaaatggtgatattaccaccccgtttgatatgcgtgttatgtcagaactggatcgttttcatctggcacagg
atgccgcactgaccaccctgggtgaaaaagcacaggcatttagcgcaaaaatggatgaaaccgttgcctatcacaaagattatattcgtgaa
catggggatgatattccggaagtgcagaattggcagtgggaaaatctggacgaa **(SEQ ID NO:90)**

Nucleic acid sequence encoding for a phosphoketolase enzyme from *Streptococcus criceti HS-6*

atgaccgagttcgacagcaaagattatctggcaaaagttgatgcatggtggcgtgcagcaaactatattagcgttgcacagatgtatctgaaa
gataatccgctgctgcgtcgtgaagttagcaaagaagatgttaaagttcatccgattggtcattggggcaccattgcaggtcagaatttatcta
tgcacatctgaatcgcgtgatcaacaaattcgatctgaacatgttttatatcgaaggtccgggtcatggtggtcaggttatggttagcaatagct
atattgatggcagctataccgaacgctatccgaatattacccaggatgaagatggtctgaaacagctgtgtaaaatctttagctttccgggtgg
tattgcaagccatgcagcaccggaaacaccgggtagcattcatgaaggtggtgaactgggttatgcactgagccatgccaccggtgcaatt
ctggataacccggatgttattgcagcaaccgttattggtgatggtgaagcagaaaccggtccgctgaatgcaggttggtttagtaatacctta
ttaacccggttaatgatggtgcagttctgccgattctgtacctgaatggcggtaaaattcataatccgaccattctgagccgtaaaaccgatga
agaactgacccacctgtttcagggtctgggttgggaaccgtattttgttgaaggtaatgatccggaagttatccatagccagatggccgaaac
cctggataaagttatcgaaaaaatcaagaccattcagacccaggcacgtcagaaacctgcagaagaggcacagcaggcacagtggcctg
ttctgattgttcgtaccccgaaaggttggacaggtccgaaagaatggaatggtgaaccgattgaaggcggttttcgtgcacatcaggttccga
ttccggttgaagcaggtcatatggaacatatcgatgccctgaccgattggctgaaaagctatcgtccggaagaacttttgatgagaaaggct
atgtgaaagaagagattcgcgttatttcaccgaaaggcaatcgtcgtatgagcatgaatccgattaccaatgccggtattgtgaaaaaactgg
atctggcagattggcgtaaacatgcaattgataccagcaaaccgggttccattatgaaacaggatatgatcgaattcggcaaatatgcagca
gatctggttaaagcaaatccggataactttcgtattttcggtccggatgaaaccaaaagcaatcgcctgaataatgtttttaccgcaaccaatcg
tcagtggctggcaccgcgtgataaaagttatgatgaatggattagtccggtgggtcgtgttattgatagtcagctgagcgaacatcaggcag
aaggttttctggaaggttatgttctgaccggtcgtcatggtttttttgcaagctatgaaagctttctgcgtgttgtggatagcatgattacacagca
ctttaaatggctgcgtaaaagcaaaacccatacggattggcgcaaaaactatccgagcctgaatctgattgcaaccagcaccgtttttcagca
ggatcataatggttatacccatcaggatccgggtctgctgacccatctggcggaaaaaaccccagaatatgttcgtgaatatctgcctgcaga
ttccaatagcctgtttgcagttatggaatatgccctggcagacgaagataaagtgaatgtgattgtgaccagtaaacatccgcgtccgcagttt
tatagcgtggcagaagcacaagaactggtaaaagaaggctacaaagtaattgattgggccagcaatgatcatgatggcgaaccggatattg
tttttgcagccgcaggcaccgaaccgaatctggaagttctggcaggtattagcctgctgcacaaagcatttccagaagtgaaaattcgctttat
caacgtggtggatattctgaaactgcgcagcccgaaagtggatccgcgtggtctgagtgatgaagcatttaacaaactgttcaccaccgata
aaccgatcgtttttgcctatcatggttatgaaggtcagattcgtgacctgtttttaaccgcgataaccacaaagtgtatatccatggctatcgcg
aaaatggtgatattaccaccccgtttgatatgcgtgttatgagcgaaatggatcgctttcatattgcaaaagaagcagcacaggccgttctgg
gtgataaagcacagggttttgcccaagaaatggcagataaactggcatatcataccgcctatattcgtgaacatggtgatgatatcccggaa
gtgcagaattggcagtgggaaaccattgat **(SEQ ID NO:91)**

Nucleic acid sequence encoding for a phosphoketolase enzyme from *Mycoplasma columbinum SF7*

atgagcaaaaccaattttgatagcaaaaaatacctggataagatccatgcatggtggcgtgcagcaaattatctgagcgttggtcagatgtat
ctgaaaaataacccgctgctgcaagaaccgctgaaagatgaagatatcaaaatctatccgattggtcattggggcaccattccgggtcagaa
tctgatttatgcacatctgaatcgcgtgatcaacaaatatgatctgaatatgttctacatcgaaggtcctggtcatggtggtcaggttatgattag
caatagctatctggatggtagctataccgaactgtttccggaaattacccaggatctggcaggtctgaataaaatgtttaaacgctttagctttc
cgggtggcaccgcaagccatgcagcaccggaaacaccgggtagcattcatgaaggtggtgaactgggttatgcactgagccatgccacc
ggtgcaattctggataatccggatgttattgcagcaaccgttattggtgatggtgaagcagaaaccggtccgctgatggcaggttggtatagc
agcagctttattaacccggttaatgatggcaccgttctgccgattctgcatattaatggtggtaaaattagcaacccgaccattctggcacgtaa
aaccgataaagaaattaaacagctgctggcaggctttggttgggaagcaatttttgttgaagccgatgtttttcgtccggaagccattcatctga
gcatggcaaaagcatttgataaagccatcgaaaaaattcagcgtattcagcgcgaagcacgtgcaaatagcgcaaatcatgcaaaacgtcc
gatttggcctgcactggttgttcgtaccccgaaaggttggacctgtccgcataaaattgatgataaagtgtatgaaggtagctttcgtagccat
caggttccgctggcagttagcagcgaaaataccaccaaaaaagttgatctggtgaattggctggaaagctataaaccgcgtgaactgttcaa
tcaggatggttcatttaaagcccattatgccgaaattgcaccgaaaggcaataaacgtatggcaatgaatccgattaccaacggtggtattaat
ccgaaaaatctggatctgccgaattgggaacagtttgccattgatttcgataaaccgggtgccattaaagcacaggatatggttagcgcagg
cacctggtttgcagatgtgattaaacgtaatccgaccaactttcgtatctttggtccggatgaaaccaaaagcaatcgtctgtttgatgtgctga
aaaccaccaatcgtcagtggttagaacgtgttgattatgacctggatgaaaacatcggtccggcaggtcgtgttattgatagccagctgagc
gaacatcaggcagaaggttttctggaaggttatgttctgaccggtcgtcatggtatgtttgcaagctatgaaagctttctgcgtgttgtggatag

catgctgacccagcatatgaaatgggttgcaaaagcgaaaaaagtgcattggcgtaatgattatccgagcctgaatgtgattgcaaccagca
ccgcatttcagcaggatcataatggttatacacatcaggatccgggtattctgggtcatctggccgataaaaaaccggaactgattcgtgaat
atctgcctgcagatagcaataccctgctggccgtgctggataaagcttttaaagaacgtgatgtcatcaacctgattgtggcaagcaaacagc
ctcgtgaacagtggtttagcccacgtgaagcaaatattctggttaaaaatgggctgaaagttattagctgggcaagcacctgtaccctggaag
aagaaccggatctggttgtggcagcagcaggtacagaaccgacactggaagcactggcagcaattagttatctgaatgaaaaattcccga
ccctgaaaatccgttttgttaatgttgtagacctgctgaaactgcgtcatccgagcattgatccgcgtggtctgagcaattatgaattcgatagc
atctttaccaaggacaaaccgatcctgtttgcctttcatggttatgaagccctgattcgcgatattttcttcctgcgcaataaccataatctgcaca
ttcatggctatcgcgaaaatggtgatattaccacgagctttgatattcgtctgatgagcgaaatggatcgttttcatatggcacagaccgcagc
aaaagccgttctgggttacgataaagcaaaaagcttcgtcgataaaatgcaggacaaaatcgatcagcataatgcctacatcaaagaacatg
gcatcgatatggatgaagttcgctattggacatggaaaggcctgaacaaa **(SEQ ID NO:92)**

Amino acid sequence of *Enterococcus gallinarum* PKL
METTFDTQEYFDKMNAWWRAANYLSVGQIYLKDNPLLRRPIEEKDLKVNPIGHWGTIA
GQNFIYTHLNRVINKYDLNMFYIEGPGHGGQVMVSNAYLDGSYTEIYPEVTQDEAGMQ
HLFKIFSFPGGIASHAAPETPGSIHEGGELGYSIAHGTGAVLDNPDVIAAVVVGDGEAET
GPLAGSWFSNTFINPVNDGAVLPILHLNGAKISNPTILARKSDEDLTKYFEGMGWTPYFV
EGDDPATVHPQMARALDRAVEQIKAIQTKARQGKADEAVMPHWPVLIVRTPKGWTGP
KIWEGEPIEGGFRAHQVPIPVNAHQMEHVDALIDWLKSYKPEELFDESGRIKAEIQELAP
KGQQRMAMNPITNGGIDPQPLKITDWRQHAIDIGVPGSTTAQDMMEFGKFARDLIVENP
TNFRIFGPDEAKSNRLNHVFEVTNRQWLEPKQPNYDEWLSATGRVIDSQLSEHQAEGFL
EGYVLTGRHGFFASYESFLRVVDSMITQHFKWTRKSKELPWRHAYPSLNLIASSTVFQQ
DHNGYTHQDPGIMTHIAEKKAEFVRVYLPADANSLMAVMAETFQTEEQINLIVSSKHPR
PQFYTAEEAEILVKDGLKIIDWASTDQGEPDLVIAAAGTEPNLEALAAVSLLNEAFPELK
IRFINVVDLLKIRHPDVDPRGLTDEEFEAYFTKDKPIIFAFHGYEGLIRDIFFGRKNQRLHI
HGYRENGDITTPFDMRILSELDRFHLAKDGAEWVYGEQAADFAQRMTETVAYHYDFIR
ENGYDIAEVQDWQWKPLK **(SEQ ID NO: 93)**

Amino acid sequence of codon optimized *Clostridium acetobutylicum* PKL
MQSIIGKHKDEGKITPEYLKKIDAYWRAANFISVGQLYLLDNPLLREPLKPEHLKRKVV
GHWGTIPGQNFIYAHLNRVIKKYDLDMIYVSGPGHGGQVMVSNSYLDGTYSEVYPNVS
RDLNGLKKLCKQFSFPGGISSHMAPETPGSINEGGELGYSLAHSFGAVFDNPDLITACVV
GDGEAETGPLATSWQANKFLNPVTDGAVLPILHLNGYKISNPTVLSRIPKDELEKFFEGN
GWKPYFVEGEDPETMHKLMAETLDIVTEEILNIQKNARENNDCSRPKWPMIVLRTPKG
WTGPKFVDGVPNEGSFRAHQVPLAVDRYHTENLDQLEEWLKSYKPEELFDENYRLIPE
LEELTPKGNKRMAANLHANGGLLLRELRTPDFRDYAVDVPTPGSTVKQDMIELGKYVR
DVVKLNEDTRNFRIFGPDETMSNRLWAVFEGTKRQWLSEIKEPNDEFLSNDGRIVDSML
SEHLCEGWLEGYLLTGRHGFFASYEAFLRIVDSMITQHGKWLKVTSQLPWRKDIASLNL
IATSNVWQQDHNGYTHQDPGLLGHIVDKKPEIVRAYLPADANTLLAVFDKCLHTKHKI
NLLVTSKHPRQQWLTMDQAVKHVEQGISIWDWASNDKGQEPDVVIASCGDTPTLEAL
AAVTILHEHLPELKVRFVNVVDMMKLLPENEHPHGLSDKDYNALFTTDKPVIFAFHGF
AHLINQLTYHRENRNLHVHGYMEEGTITTPFDMRVQNKLDRFNLVKDVVENLPQLGNR
GAHLVQLMNDKLVEHNQYIREVGEDLPEITNWQWHV **(SEQ ID NO: 94)**

L. gray mvaE nucleic acid sequence
ATGGTTAAAGACATTGTAATAATTGATGCCCTCCGTACTCCCATCGGTAAGTACCGC
GGTCAGCTCTCAAAGATGACGGCGGTGGAATTGGGAACCGCAGTTACAAAGGCTCT
GTTCGAGAAGAACGACCAGGTCAAAGACCATGTAGAACAAGTCATTTTTGGCAACG
TTTTACAGGCAGGGAACGGCCAGAATCCCGCCCGTCAGATCGCCCTTAATTCTGGCC

TGTCCGCAGAGATACCGGCTTCGACTATTAACCAGGTGTGTGGTTCTGGCCTGAAAG
CAATAAGCATGGCGCGCCAACAGATCCTACTCGGAGAAGCGGAAGTAATAGTAGCA
GGAGGTATCGAATCCATGACGAATGCGCCGAGTATTACATATTATAATAAAGAAGA
AGACACCCTCTCAAAGCCTGTTCCTACGATGACCTTCGATGGTCTGACCGACGCGTT
TAGCGGAAAGATTATGGGTTTAACAGCCGAAAATGTTGCCGAACAGTACGGCGTAT
CACGTGAGGCCCAGGACGCCTTTGCGTATGGATCGCAGATGAAAGCAGCAAAGGCC
CAAGAACAGGGCATTTTCGCAGCTGAAATACTGCCTCTTGAAATAGGGGACGAAGT
TATTACTCAGGACGAGGGGGTTCGTCAAGAGACCACCCTCGAAAAATTAAGTCTGC
TTCGGACCATTTTTAAAGAAGATGGTACTGTTACAGCGGGCAACGCCTCAACGATC
AATGATGGCGCCTCAGCCGTGATCATTGCATCAAAGGAGTTTGCTGAGACAAACCA
GATTCCCTACCTTGCGATCGTACATGATATTACAGAGATAGGCATTGATCCATCAAT
AATGGGCATTGCTCCCGTGAGTGCGATCAATAAACTGATCGATCGTAACCAAATTA
GCATGGAAGAAATCGATCTCTTTGAAATTAATGAGGCATTTGCAGCATCCTCGGTGG
TAGTTCAAAAAGAGTTAAGCATTCCCGATGAAAAGATCAATATTGGCGGTTCCGGT
ATTGCACTAGGCCATCCTCTTGGCGCCACAGGAGCGCGCATTGTAACCACCCTAGCG
CACCAGTTGAAACGTACACACGGACGCTATGGTATTGCCTCCCTGTGCATTGGCGGT
GGCCTTGGCCTAGCAATATTAATAGAAGTGCCTCAGGAAGATCAGCCGGTTAAAAA
ATTTTATCAATTGGCCCGTGAGGACCGTCTGGCTAGACTTCAGGAGCAAGCCGTGAT
CAGCCCAGCTACAAAACATGTACTGGCAGAAATGACACTTCCTGAAGATATTGCCG
ACAATCTGATCGAAAATCAAATATCTGAAATGGAAATCCCTCTTGGTGTGGCTTTGA
ATCTGAGGGTCAATGATAAGAGTTATACCATCCCACTAGCAACTGAGGAACCGAGT
GTAATCGCTGCCTGTAATAATGGTGCAAAAATGGCAAACCACCTGGGCGGTTTTCA
GTCAGAATTAAAAGATGGTTTCCTGCGTGGGCAAATTGTACTTATGAACGTCAAAG
AACCCGCAACTATCGAGCATACGATCACGGCAGAGAAAGCGGCAATTTTTCGTGCC
GCAGCGCAGTCACATCCATCGATTGTGAAACGAGGTGGGGGTCTAAAAGAGATAGT
AGTGCGTACGTTCGATGATGATCCGACGTTCCTGTCTATTGATCTGATAGTTGATAC
TAAAGACGCAATGGGCGCTAACATCATTAACACCATTCTCGAGGGTGTAGCCGGCT
TTCTGAGGGAAATCCTTACCGAAGAAATTCTGTTCTCTATTTTATCTAATTACGCAA
CCGAATCAATTGTGACCGCCAGCTGTCGCATACCTTACGAAGCACTGAGTAAAAAA
GGTGATGGTAAACGAATCGCTGAAAAAGTGGCTGCTGCATCTAAATTTGCCCAGTT
AGATCCTTATCGAGCTGCAACCCACAACAAAGGTATTATGAATGGTATTGAGGCCG
TCGTTTTGGCCTCAGGAAATGACACACGGGCGGTCGCGGCAGCCGCACATGCGTAT
GCTTCACGCGATCAGCACTATCGGGGCTTAAGCCAGTGGCAGGTTGCAGAAGGCGC
GTTACACGGGGAGATCAGTCTACCACTTGCACTCGGCAGCGTTGGCGGTGCAATTG
AGGTCTTGCCTAAAGCGAAGGCGGCATTCGAAATCATGGGGATCACAGAGGCGAAG
GAGCTGGCAGAAGTCACAGCTGCGGTAGGGCTGGCGCAAAACCTGGCGGCGTTAAG
AGCGCTTGTTAGTGAAGGAATACAGCAAGGTCACATGTCGCTCCAGGCTCGCTCTCT
TGCATTATCGGTAGGTGCTACAGGCAAGGAAGTTGAAATCCTGGCCGAAAAATTAC
AGGGCTCTCGTATGAATCAGGCGAACGCTCAGACCATACTCGCAGAGATCAGATCG
CAAAAAGTTGAATTGTGA (**SEQ ID NO:95**)

<u>*E. faecium mvaE*</u> <u>nucleic acid sequence</u>
ATGAAAGAAGTGGTTATGATTGATGCGGCTCGCACACCCATTGGGAAATACAGAGG
TAGTCTTAGTCCTTTTACAGCGGTGGAGCTGGGGACACTGGTCACGAAAGGGCTGCT
GGATAAAACAAAGCTTAAGAAAGACAAGATAGACCAAGTGATATTCGGCAATGTG
CTTCAGGCAGGAAACGGACAAAACGTTGCAAGACAAATAGCCCTGAACAGTGGCTT
ACCAGTTGACGTGCCGGCGATGACTATTAACGAAGTTTGCGGGTCCGGAATGAAAG
CGGTGATTTTAGCCCGCCAGTTAATACAGTTAGGGGAGGCAGAGTTGGTCATTGCA

GGGGGTACGGAGTCAATGTCACAAGCACCCATGCTGAAACCTTACCAGTCAGAGAC
CAACGAATACGGAGAGCCGATATCATCAATGGTTAATGACGGGCTGACGGATGCGT
TTTCCAATGCTCACATGGGTCTTACTGCCGAAAAGGTGGCGACCCAGTTTTCAGTGT
CGCGCGAGGAACAAGACCGGTACGCATTGTCCAGCCAATTGAAAGCAGCGCACGCG
GTTGAAGCCGGGGTGTTCTCAGAAGAGATTATTCCGGTTAAGATTAGCGACGAGGA
TGTCTTGAGTGAAGACGAGGCAGTAAGAGGCAACAGCACTTTGGAAAAACTGGGCA
CCTTGCGGACGGTGTTTTCTGAAGAGGGCACGGTTACCGCTGGCAATGCTTCACCGC
TGAATGACGGCGCTAGTGTCGTGATTCTTGCATCAAAAGAATACGCGGAAAACAAT
AATCTGCCTTACCTGGCGACGATAAAGGAGGTTGCGGAAGTTGGTATCGATCCTTCT
ATCATGGGTATTGCCCCAATAAAGGCCATTCAAAAGTTAACAGATCGGTCGGGCAT
GAACCTGTCCACGATTGATCTGTTCGAAATTAATGAAGCATTCGCGGCATCTAGCAT
TGTTGTTTCTCAAGAGCTGCAATTGGACGAAGAAAAAGTGAATATCTATGGCGGGG
CGATAGCTTTAGGCCATCCAATCGGCGCAAGCGGAGCCCGGATACTGACAACCTTA
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CGTTCAGAAGAAAAAGTTTTACCAGCTTACCCCCTCCGAGCGGAGATCGCAGCTTAT
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CCGAAGAACTGTCCGATCACATGATTGAGAATCAGGTCTCCGAAGTGGAAATTCCA
ATGGGAATTGCACAAAATTTTCAGATTAATGGCAAGAAAAAATGGATTCCTATGGC
GACTGAAGAACCTTCAGTAATAGCGGCAGCATCGAACGGCGCCAAAATCTGCGGGA
ACATTTGCGCGGAAACGCCTCAGCGGCTTATGCGCGGGCAGATTGTCCTGTCTGGCA
AATCAGAATATCAAGCCGTGATAAATGCCGTGAATCATCGCAAAGAAGAACTGATT
CTTTGCGCAAACGAGTCGTACCCGAGTATTGTTAAACGCGGGGGAGGTGTTCAGGA
TATTTCTACGCGGGAGTTTATGGGTTCTTTTCACGCGTATTTATCAATCGACTTTCTG
GTGGACGTCAAGGACGCAATGGGGGCAAACATGATCAACTCTATTCTCGAAAGCGT
TGCAAATAAACTGCGTGAATGGTTCCCGGAAGAGGAAATACTGTTCTCCATCCTGTC
AAACTTCGCTACGGAGTCCCTGGCATCTGCATGTTGCGAGATTCCTTTTGAAAGACT
TGGTCGTAACAAAGAAATTGGTGAACAGATCGCCAAGAAAATTCAACAGGCAGGG
GAATATGCTAAGCTTGACCCTTACCGCGCGGCAACCCATAACAAGGGGATTATGAA
CGGTATCGAAGCCGTCGTTGCCGCAACGGGAAACGACACACGGGCTGTTTCCGCTT
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TCAAGGGCGATAAACTGGTTGGTAAATTAACAGTCCCACTGGCTGTGGCGACTGTC
GGTGGCGCGTCGAACATATTACCAAAAGCCAAAGCTTCCCTCGCCATGCTGGATATT
GATTCCGCAAAAGAACTGGCCCAAGTGATCGCCGCGGTAGGTTTAGCACAGAATCT
GGCGGCGTTACGTGCATTAGTGACAGAAGGCATTCAGAAAGGACACATGGGCTTGC
AAGCACGTTCTTTAGCGATTTCGATAGGTGCCATCGGTGAGGAGATAGAGCAAGTC
GCGAAAAAACTGCGTGAAGCTGAAAAAATGAATCAGCAAACGGCAATACAGATTTT
AGAAAAAATTCGCGAGAAATGA **(SEQ ID NO:96)**

<u>*E. gallinarum mvaE* nucleic acid sequence</u>
ATGGAAGAAGTGGTAATTATAGATGCACGTCGGACTCCGATTGGTAAATATCACGG
GTCGTTGAAGAAGTTTTCAGCGGTGGCGCTGGGGACGGCCGTGGCTAAAGACATGT
TCGAACGCAACCAGAAAATCAAAGAGGAGATCGCGCAGGTCATAATTGGTAATGTC
TTGCAGGCAGGAAATGGCCAGAACCCCGCGCGGCAAGTTGCTCTTCAATCAGGGTT
GTCCGTTGACATTCCCGCTTCTACAATTAACGAGGTTTGTGGGTCTGGTTTGAAAGC
TATCTTGATGGGCATGGAACAAATCCAACTCGGCAAAGCGCAAGTAGTGCTGGCAG
GCGGCATTGAATCAATGACAAATGCGCCAAGCCTGTCCCACTATAACAAGGCGGAG
GATACGTATAGTGTCCCAGTGTCGAGCATGACACTGGATGGTCTGACAGACGCATTT

TCTAGTAAACCTATGGGATTAACAGCGGAAAACGTCGCACAGCGCTACGGTATCTC
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AGGCAGAAAACAAATTCGCTAAGGAAATTGTGCCACTGGCGGGTGAAACTAAAACC
ATCACAGCTGACGAAGGGATCAGATCCCAAACAACGATGGAGAAACTGGCAAGTCT
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ATGACGGGGCCGCCCTTGTGCTGCTTGCTAGCAAAACTTACTGCGAAACTAATGAC
ATACCGTACCTTGCGACAATCAAAGAAATTGTTGAAGTTGGAATCGATCCGGAGAT
TATGGGCATCTCTCCGATAAAAGCGATACAAACATTGTTACAAAATCAAAAAGTTA
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GGACACTGCAAACCATTTGATAGAAAATCAAATATCAGAGATTGAACTCCCAATGG
GCGTCGGGATGAACCTGAAGGTTGATGGGAAAGCCTATGTTGTGCCAATGGCGACG
GAAGAGCCGTCCGTCATCGCGGCCATGTCTAATGGTGCCAAAATGGCCGGCGAAAT
TCACACTCAGTCGAAAGAACGGCTGCTCAGAGGTCAGATTGTTTTCAGCGCGAAGA
ATCCGAATGAAATCGAACAGAGAATAGCTGAGAACCAAGCTTTGATTTTCGAACGT
GCCGAACAGTCCTATCCTTCCATTGTGAAAAGAGAGGGAGGTCTCCGCCGCATTGC
ACTTCGTCATTTTCCTGCCGATTCTCAGCAGGAGTCTGCGGACCAGTCCACATTTTTA
TCAGTGGACCTTTTTGTAGATGTGAAAGACGCGATGGGGGCAAATATCATAAATGC
AATACTTGAGGGCGTCGCAGCCCTGTTTCGCGAATGGTTCCCCAATGAGGAAATTCT
TTTTTCTATTCTCTCGAACTTGGCTACGGAGAGCTTAGTCACGGCTGTTTGTGAAGTC
CCATTTAGTGCACTTAGCAAGAGAGGTGGTGCAACGGTGGCCCAGAAAATTGTGCA
GGCGTCGCTCTTCGCAAAGACAGACCCATACCGCGCAGTGACCCACAACAAAGGGA
TTATGAACGGTGTAGAGGCTGTTATGCTTGCCACAGGCAACGACACGCGCGCAGTC
TCAGCCGCTTGTCATGGATACGCAGCGCGCACCGGTAGCTATCAGGGTCTGACTAA
CTGGACGATTGAGTCGGATCGCCTGGTAGGCGAGATAACACTGCCGCTGGCCATCG
CTACAGTTGGAGGCGCTACCAAAGTGTTGCCCAAAGCTCAAGCGGCACTGGAGATT
AGTGATGTTCACTCTTCTCAAGAGCTTGCAGCCTTAGCGGCGTCAGTAGGTTTAGTA
CAAAATCTCGCGGCCCTGCGCGCACTGGTTTCCGAAGGTATACAAAAAGGGCACAT
GTCCATGCAAGCCCGGTCTCTCGCAATCGCGGTCGGTGCTGAAAAAGCCGAGATCG
AGCAGGTCGCCGAAAAGTTGCGGCAGAACCCGCCAATGAATCAGCAGCAGGCGCTC
CGTTTTCTTGGCGAGATCCGCGAACAATGA **(SEQ ID NO:97)**

<u>*E. casseliflavus mvaE* nucleic acid sequence</u>
ATGGAAGAAGTTGTCATCATTGACGCACTGCGTACTCCAATAGGAAAGTACCACGG
TTCGCTGAAAGATTACACAGCTGTTGAACTGGGGACAGTAGCAGCAAAGGCGTTGC
TGGCACGAAATCAGCAAGCAAAAGAACACATAGCGCAAGTTATTATTGGCAACGTC
CTGCAAGCCGGAAGTGGGCAGAATCCAGGCCGACAAGTCAGTTTACAGTCAGGATT
GTCTTCTGATATCCCCGCTAGCACGATCAATGAAGTGTGTGGCTCGGGTATGAAAGC
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AGGCGGCGAAAAAGTTTGATCAGGAAATTGTACCCCTGACGGAAAAATCCGGAACG
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ATCAGCTGAAAGATACCCAGGAGCGCTACGGTATAGCTTCCTTATGCGTTGGTGGG
GGTCTTGGATTGGCGATGCTTCTGGAAAACCCATCGGCCACTGCCTCACAAACTAAT
TTTGATGAGGAATCTGCTTCCGAAAAAACTGAGAAGAAGAAGTTTTATGCGCTAGC
TCCTAACGAACGCTTAGCGTTTTTGGAAGCCCAAGGCGCTATTACCGCTGCTGAAAC
CCTGGTCTTCCAGGAGATGACCTTAAACAAAGAGACAGCCAATCACTTAATCGAAA
ACCAAATCAGCGAAGTTGAAATTCCTTTAGGCGTGGGCCTGAACTTACAGGTGAAT
GGGAAAGCGTATAATGTTCCTCTGGCCACGGAGGAACCGTCCGTTATCGCTGCGAT
GTCGAATGGCGCCAAAATGGCTGGTCCTATTACAACAACAAGTCAGGAGAGGCTGT
TACGGGGTCAGATTGTCTTCATGGACGTACAGGACCCAGAAGCAATATTAGCGAAA
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GTGAAAAGAGGAGGAGGTCTGCGTAGAGTCATTGGCAGGAATTTCAGTCCGGCCGA
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GTCGACAAGTAGCTGGTAAAATAGTGCACGCGGCGGACTTTGCTAAGATAGATCCA
TACAGAGCTGCCACACACAATAAAGGTATTATGAATGGCGTTGAAGCGTTAATCTT
AGCCACCGGTAATGACACCCGTGCGGTGTCGGCTGCATGCCACGGTTACGCGGCAC
GCAATGGGCGAATGCAAGGGCTTACCTCTTGGACGATTATCGAAGATCGGCTGATA
GGCTCTATCACATTACCTTTGGCTATTGCGACAGTGGGGGGTGCCACAAAAATCTTG
CCAAAAGCACAGGCCGCCCTGGCGCTAACTGGCGTTGAGACGGCGTCGGAACTGGC
CAGCCTGGCGGCGAGTGTGGGATTAGTTCAAAATTTGGCCGCTTTACGAGCACTAGT
GAGCGAGGGCATTCAGCAAGGGCACATGAGTATGCAAGCTAGATCCCTGGCCATTA
GCGTAGGTGCGAAAGGTACTGAAATAGAGCAACTAGCTGCGAAGCTGAGGGCAGC
GACGCAAATGAATCAGGAGCAGGCTCGTAAATTTCTGACCGAAATAAGAAATTAA
(SEQ ID NO:98)

<u>*L.grayi mvaS*</u> <u>nucleic acid sequence</u>
ATGACCATGAACGTTGGAATCGATAAAATGTCATTCTTTGTTCCACCTTACTTTGTG
GACATGACTGATCTGGCAGTAGCACGGGATGTCGATCCCAATAAGTTTCTGATTGGT
ATTGGCCAGGACCAGATGGCAGTTAATCCGAAAACGCAGGATATTGTGACATTTGC
CACAAATGCTGCCAAAAACATACTGTCAGCTGAGGACCTTGATAAAATTGATATGG
TCATAGTCGGCACCGAGAGTGGAATCGATGAATCCAAAGCGAGTGCCGTAGTGCTT
CACAGGTTGCTCGGTATCCAGAAGTTTGCTCGCTCCTTTGAAATCAAAGAAGCCTGT
TATGGGGGTACCGCGGCTTTACAGTTCGCTGTAAACCACATTAGGAATCATCCTGAA
TCAAAGGTTCTTGTAGTTGCATCAGATATCGCGAAATACGGCCTGGCTTCTGGAGGT
GAACCAACGCAAGGTGCAGGCGCTGTGGCTATGCTCGTCTCAACTGACCCTAAGAT
CATTGCTTTCAACGACGATAGCCTCGCGCTTACACAAGATATCTATGACTTCTGGCG
ACCAGTTGGACATGACTATCCTATGGTCGACGGGCCTCTTAGTACAGAGACCTACAT

CCAGTCATTTCAGACCGTATGGCAGGAATACACAAAACGGTCGCAGCATGCACTGG
CAGACTTTGCTGCCCTTAGCTTTCATATCCCGTATACTAAAATGGGCAAAAAGGCGC
TGCTTGCAATCCTTGAAGGCGAATCAGAGGAGGCTCAGAACCGTATACTAGCAAAA
TATGAAAAGAGTATAGCCTACTCCAGAAAGGCGGGTAACCTGTATACCGGTAGCCT
GTATCTAGGACTTATTTCACTTCTGGAAAATGCAGAAGACCTTAAAGCTGGTGATTT
AATAGGCCTCTTTTCTTACGGTTCCGGTGCTGTTGCGGAGTTTTTCTCAGGAAGGCT
GGTTGAGGACTATCAGGAACAGCTACTTAAAACAAAACATGCCGAACAGCTGGCCC
ATAGAAAGCAACTGACAATCGAGGAGTACGAAACGATGTTCTCCGATCGCTTGGAC
GTGGACAAAGACGCCGAATACGAAGACACATTAGCTTATAGCATTTCGTCAGTCCG
AAACACCGTACGTGAGTACAGGAGTTGA **(SEQ ID NO:99)**

E. faecium mvaS nucleic acid sequence
ATGAAAATCGGTATTGACCGTCTGTCCTTCTTCATCCCGAATTTGTATTTGGACATG
ACTGAGCTGGCAGAATCACGCGGGGATGATCCAGCTAAATATCATATTGGAATCGG
ACAAGATCAGATGGCAGTGAATCGCGCAAACGAGGACATCATAACACTGGGTGCA
AACGCTGCGAGTAAGATCGTGACAGAGAAAGACCGCGAGTTGATTGATATGGTAAT
CGTTGGCACGGAATCAGGAATTGACCACTCCAAAGCAAGCGCCGTGATTATTCACC
ATCTCCTTAAAATTCAGTCGTTCGCCCGTTCTTTCGAGGTAAAAGAAGCTTGCTATG
GCGGAACTGCTGCCCTGCACATGGCGAAGGAGTATGTCAAAAATCATCCGGAGCGT
AAGGTCTTGGTAATTGCGTCAGACATCGCGCGTTATGGTTTGGCCAGCGGAGGAGA
AGTTACTCAAGGCGTGGGGGCCGTAGCCATGATGATTACACAAAACCCCCGGATTC
TTTCGATTGAAGACGATAGTGTTTTTCTCACAGAGGATATCTATGATTTCTGGCGGC
CTGATTACTCCGAGTTCCCTGTAGTGGACGGGCCCCTTTCAAACTCAACGTATATAG
AGAGTTTTCAGAAAGTTTGGAACCGGCACAAGGAATTGTCCGGAAGAGGGCTGGAA
GATTATCAAGCTATTGCTTTTCACATACCCTATACGAAGATGGGTAAGAAAGCGCTC
CAGAGTGTTTTAGACCAAACCGATGAAGATAACCAGGAGCGCTTAATGGCTAGATA
TGAGGAGTCTATTCGCTATAGCCGGAGAATTGGTAACCTGTACACAGGCAGCTTGT
ACCTTGGTCTTACAAGCTTGTTGGAAAACTCTAAAAGTTTACAACCGGGAGATCGG
ATCGGCCTCTTTTCCTATGGCAGTGGTGCGGTGTCCGAGTTCTTTACCGGGTATTTAG
AAGAAAATTACCAAGAGTACCTGTTCGCTCAAAGCCATCAAGAAATGCTGGATAGC
CGGACTCGGATTACGGTCGATGAATACGAGACCATCTTTTCAGAGACTCTGCCAGA
ACATGGTGAATGCGCCGAATATACGAGCGACGTCCCCTTTTCTATAACCAAGATTGA
GAACGACATTCGTTATTATAAAATCTGA **(SEQ ID NO:100)**

E. gallinarum mvaS nucleic acid sequence
ATGAACGTCGGCATTGACAAAATTAATTTTTTCGTTCCACCGTATTATCTGGATATG
GTCGACCTGGCCCACGCACGCGAAGTGGACCCGAACAAATTTACAATTGGAATTGG
ACAGGATCAGATGGCTGTGAGCAAAAAGACGCACGATATCGTAACATTCGCGGCTA
GTGCCGCGAAGGAAATTTTAGAACCTGAGGACTTGCAAGCTATAGACATGGTTATA
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TTTGTTGGGCGTACAACCTTTCGCTCGCAGTTTTGAAATTAAAGAAGCCTGTTACGG
GGCAACCGCAGGCATTCAGTTTGCCAAGACTCATATACAAGCGAACCCGGAGAGCA
AGGTCCTGGTAATTGCAAGCGATATAGCTCGGTATGGTCTTCGGTCAGGTGGAGAG
CCCACACAAGGCGCAGGGGCAGTTGCTATGCTTCTCACGGCAAATCCCAGAATCCT
GACCTTCGAAAACGACAATCTGATGTTAACGCAGGATATTTATGACTTCTGGAGACC
ACTTGGTCACGCTTACCCTATGGTAGATGGCCACCTTTCCAATCAAGTCTATATTGA
CAGTTTTAAGAAGGTCTGGCAAGCACATTGCGAACGCAATCAAGCTTCTATATCCG
ACTATGCCGCGATTAGTTTTCATATTCCGTATACAAAAATGGGTAAGAAAGCCCTGC

TCGCTGTTTTTGCAGATGAAGTGGAAACTGAACAGGAACGCGTTATGGCACGGTAT
GAAGAGTCTATCGTATATTCACGCCGGATCGGCAACTTGTATACGGGATCATTGTAC
CTGGGGCTGATATCCTTATTGGAAAACAGTTCTCACCTGTCGGCGGGCGACCGGATA
GGATTGTTTAGTTATGGGAGTGGCGCTGTCAGCGAATTTTTCTCCGGTCGTTTAGTG
GCAGGCTATGAAAATCAATTGAACAAAGAGGCGCATACCCAGCTCCTGGATCAGCG
TCAGAAGCTTTCCATCGAAGAGTATGAGGCGATTTTTACAGATTCCTTAGAAATTGA
TCAGGATGCAGCGTTCTCGGATGACCTGCCATATTCCATCCGCGAGATAAAAAACA
CGATTCGGTACTATAAGGAGAGCTGA (**SEQ ID NO:101**)

<u>*E. casseliflavus mvaS* nucleic acid sequence</u>
ATGAACGTTGGAATTGATAAAATCAATTTTTTCGTTCCGCCCTATTTCATTGATATGG
TGGATCTCGCTCATGCAAGAGAAGTTGACCCCAACAAGTTCACTATAGGAATAGGC
CAAGATCAGATGGCAGTAAACAAGAAAACGCAAGATATCGTAACGTTCGCGATGCA
CGCCGCGAAGGATATTCTGACTAAGGAAGATTTACAGGCCATAGATATGGTAATAG
TGGGGACTGAGTCTGGGATCGACGAGAGCAAGGCAAGTGCTGTCGTATTGCATCGG
CTTTTAGGTATTCAGCCTTTTGCGCGCTCCTTTGAAATTAAGGAGGCATGCTATGGG
GCCACTGCCGGCCTTCAGTTTGCAAAAGCTCATGTGCAGGCTAATCCCCAGAGCAA
GGTCCTGGTGGTAGCTTCCGATATAGCACGCTACGGACTGGCATCCGGAGGAGAAC
CGACTCAAGGTGTAGGTGCTGTGGCAATGTTGATTTCCGCTGATCCAGCTATCTTGC
AGTTAGAAAATGATAATCTCATGTTGACCCAAGATATATACGATTTTTGGCGCCCGG
TCGGGCATCAATATCCTATGGTAGACGGCCATCTGTCTAATGCCGTCTATATAGACA
GCTTTAAACAAGTCTGGCAAGCACATTGCGAGAAAAACCAACGGACTGCTAAAGAT
TATGCTGCATTGTCGTTCCATATTCCGTACACGAAAATGGGTAAGAAAGCTCTGTTA
GCGGTTTTTGCGGAGGAAGATGAGACAGAACAAAAGCGGTTAATGGCACGTTATGA
AGAATCAATTGTATACAGTCGTCGGACTGGAAATCTGTATACTGGCTCACTCTATCT
GGGCCTGATTTCCTTACTGGAGAATAGTAGCAGTTTACAGGCGAACGATCGCATAG
GTCTGTTTAGCTATGGTTCAGGGGCCGTTGCGGAATTTTTCAGTGGCCTCTTGGTAC
CGGGTTACGAGAAACAATTAGCGCAAGCTGCCCATCAAGCTCTTCTGGACGACCGG
CAAAAACTGACTATCGCAGAGTACGAAGCCATGTTTAATGAAACCATTGATATTGA
TCAGGACCAGTCATTTGAGGATGACTTACTGTACTCCATCAGAGAGATCAAAAACA
CTATTCGCTACTATAACGAGGAGAATGAATAA (**SEQ ID NO:102**)

<u>Amino acid sequence of acetoacetyl-CoA synthase</u>
MTDVRFRIIGTGAYVPERIVSNDEVGAPAGVDDDWITRKTGIRQRRWAADDQATSDLA
TAAGRAALKAAGITPEQLTVIAVATSTPDRPQPPTAAYVQHHLGATGTAAFDVNAVCS
GTVFALSSVAGTLVYRGGYALVIGADLYSRILNPADRKTVVLFGDGAGAMVLGPTSTG
TGPIVRRVALHTFGGLTDLIRVPAGGSRQPLDTDGLDAGLQYFAMDGREVRRFVTEHLP
QLIKGFLHEAGVDAADISHFVPHQANGVMLDEVFGELHLPRATMHRTVETYGNTGAAS
IPITMDAAVRAGSFRPGELVLLAGFGGGMAASFALIEW (**SEQ ID NO: 103**)

<u>*L. lactis* PKL nucleic acid sequence</u>

atgaccgagtataacagcgaggcctatctgaaaaaactggataaatggtggcgtgcagcaacctatctgggtgcaggtatgatttttctgaaa
gaaaatccgctgtttagcgttaccggcaccccgattaaagcagaaaatctgaaagccaatccgattggtcattggggcaccgttagcggtca
gacctttctgtatgcacatgcaaatcgtctgatcaacaaatatgatcagaaaatgttttatatgggtggtccgggtcatggtggtcaggcaatg
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cagaaccgaccattgaaaccctggcagccctgcatctggttaatgaagtgtttccgcaggcaaaatttcgctatgttaatgttgttgagctggg
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ccggattttaccgaatgggtttggagcgatctgaagaaa **(SEQ ID NO:104)**

L. lactis PKL amino acid sequence

MTEYNSEAYL KKLDKWWRAA TYLGAGMIFL KENPLFSVTG TPIKAENLKA
NPIGHWGTVS GQTFLYAHAN RLINKYDQKM FYMGGPGHGG QAMVVPSYLD
GSYTEAYPEI TQDLEGMSRL FKRFSFPGGI GSHMTAQTPG SLHEGGELGY
VLSHATGAIL DQPEQIAFAV VGDGEAETGP LMTSWHSIKF INPKNDGAIL
PILDLNGFKI SNPTLFARTS DVDIRKFFEG LGYSPRYIEN DDIHDYMAYH
KLAAEVFDKA IEDIHQIQKD AREDNRYQNG EIPAWPIVIA RLPKGWGGPR
YNDWSGPKFD GKGMPIEHSF RAHQVPLPLS SKNMGTLPEF VKWMTSYQPE
TLFNADGSLK EELRDFAPKG EMRMASNPVT NGGVDSSNLV LPDWQEFANP
ISENNRGKLL PDTNDNMDMN VLSKYFAEIV KLNPTRFRLF GPDETMSNRF
WEMFKVTNRQ WMQVIKNPND EFISPEGRII DSQLSEHQAE GWLEGYTLTG
RTGAFASYES FLRVVDSMLT QHFKWIRQAA DQKWRHDYPS LNVISTSTVF
QQDHNGYTHQ DPGMLTHLAE KKSDFIRQYL PADGNTLLAV FDRAFQDRSK
INHIVASKQP RQQWFTKEEA EKLATDGIAT IDWASTAKDG EAVDLVFASA
GAEPTIETLA ALHLVNEVFP QAKFRYVNVV ELGRLQKKKG ALNQERELSD
EEFEKYFGPS GTPVIFGFHG YEDLIESIFY QRGHDGLIVH GYREDGDITT
TYDMRVYSEL DRFHQAIDAM QVLYVNRKVN QGLAKAFIDR MKRTLVKHFE
VTRNEGVDIP DFTEWVWSDL KK **(SEQ ID NO:105)**