

Supplementary Material

Heterologous Hyaluronic Acid production in *Kluyveromyces lactis*

Antônio M. V. Gomes¹, João H. C. M. Netto¹, Lucas S. Carvalho¹ and Nádia S. Parachin^{1*}

¹Grupo de Engenharia de Biocatalisadores, Departamento de Biologia Celular, Instituto de Ciências Biológicas, Universidade de Brasília (UnB), Campus Darcy Ribeiro, Bloco K. 70.790-900. Brasília, Distrito Federal, Brazil.

* **Correspondence:** nadiasp@unb.br;

SUPPORTING INFORMATION CONTENTS

Figure S01. pBSK-hasB-----	04
Figure S02. p424-GPD-B-----	05
Figure S03. pBSK-HASAP-----	06
Figure S04. pBSK-HASA1-----	07
Figure S05. pBSK-HASA2-----	08
Figure S06. pBSK-HASA3-----	09
Figure S07. pKlac2-B-----	10
Figure S08. pKlac2-BP-----	11
Figure S09. pKlac2-B1-----	12
Figure S10. pKlac2-B2-----	13
Figure S11. pKlac2-B3-----	14
Sequence S01. pBSK-HASB-----	15
Sequence S02. p424-GPD-B-----	16
Sequence S03. pBSK-HASAP-----	18
Sequence S04. pBSK-HASA1-----	20
Sequence S05. pBSK-HASA2-----	22
Sequence S06. pBSK-HASA3-----	23
Sequence S07. pKLAC2-B-----	25
Sequence S08. pKLAC2-BP-----	28
Sequence S09. pKLAC2-B1-----	33

Sequence S10. pkLAC2-B2-----	37
Sequence S11. pkLAC2-B3-----	41
Table S01. Primers utilized in study-----	45
Figure S12. RNA Integrity Gel-----	46
Figure S13. RNA Integrity Gel-----	46
Figure S14. Melt Curve Analysis-----	47
Figure S15. Melt Curve Analysis-----	48
Figure S16. Melt Curve Analysis-----	49
Figure S17. Melt Curve Analysis-----	50
Figure S18. Melt Curve Analysis-----	51
Figure S19. Growth profile of the strains-----	52
Figure S20. Transcript analysis of strains-----	52
Figure S21. Copy Number Gene-----	53
Figure S22. GPC analysis of standard HA (Sigma)-----	54
Figure S23. Standard Curve of Carbazole Method-----	54

SUPPLEMENTARY INFORMATION

Figure S01. Map of the synthetic plasmid pBSK-HASB containing the *hasB* gene (UDP-Glucose Dehydrogenase) from *Xenopus laevis* (*xlhasB*) optimized for the yeast *K. lactis*. The sites for the *Bam*HI and *Sal*I enzymes are highlighted. The annealing site of the oligonucleotide primers for transcripts analysis (Rt-PCR HASB-F and Rt-PCR HASB-R) and amplification of *hasB* gene (HASB-F and HASB-R) is also shown.

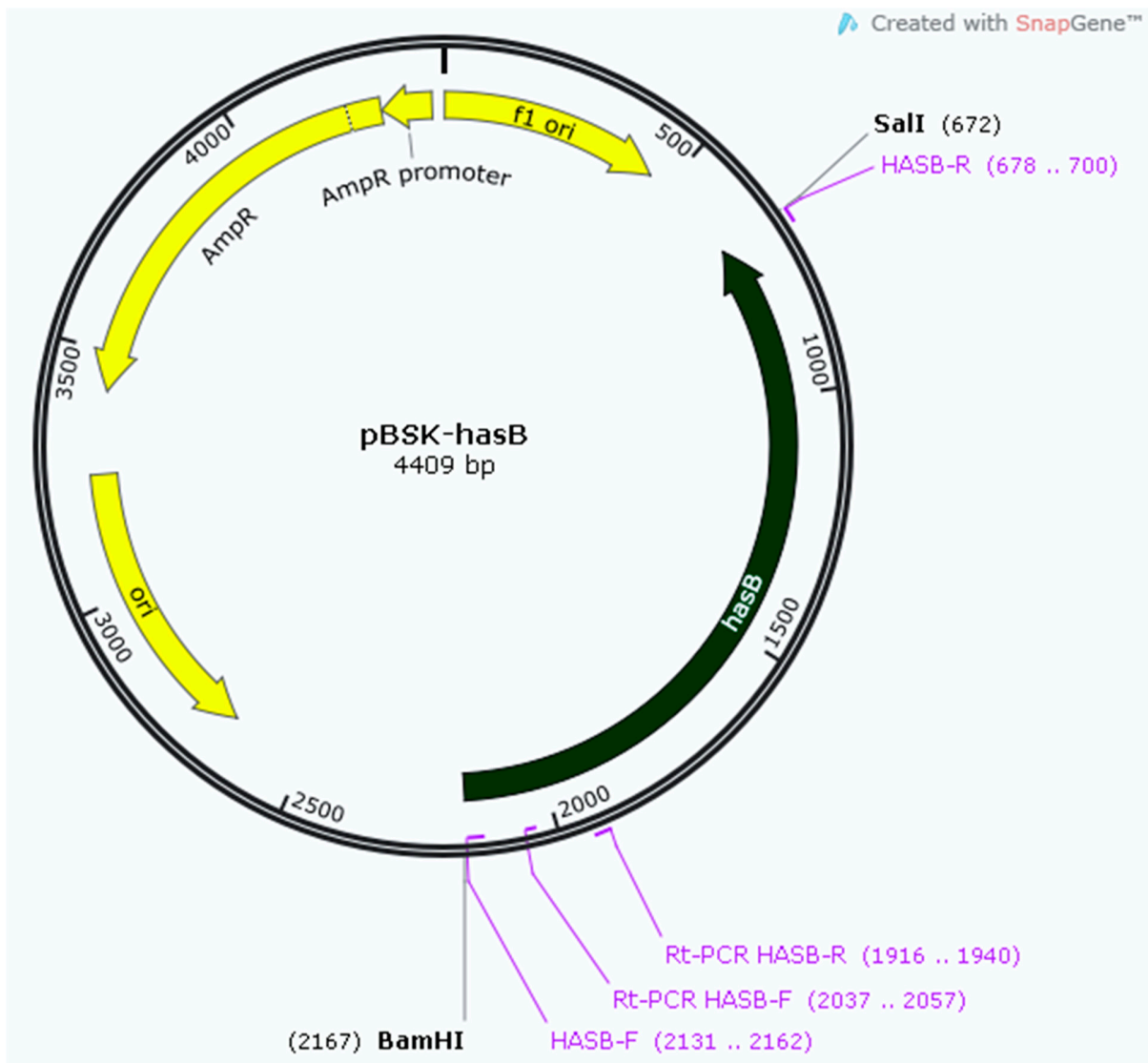


Figure S02. Map of the plasmid p424-GPD-B with *xlhasB* gene (UDP-Glucose Dehydrogenase) cloned between GPD promoter and CYC1 terminator.

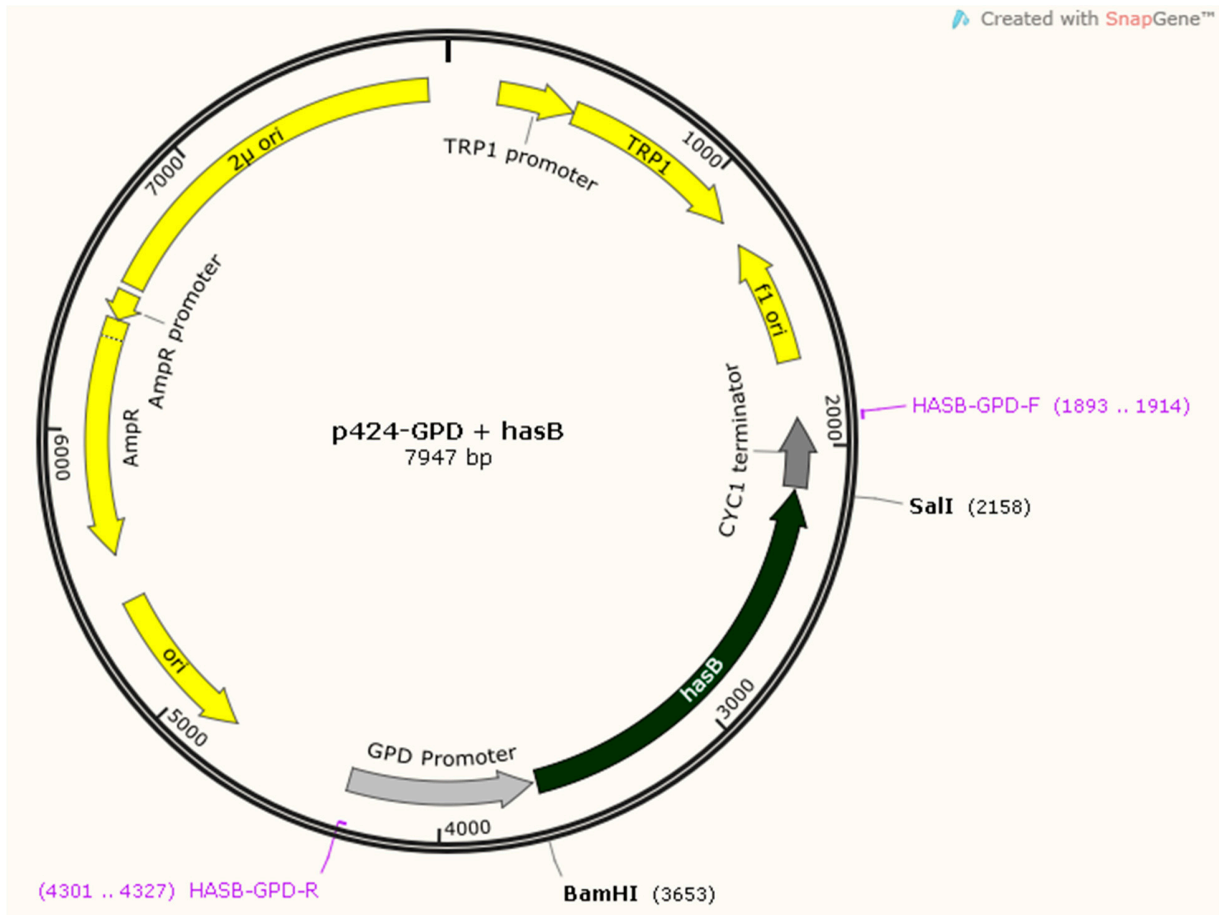


Figure S03. Map of the synthetic plasmid pBSK-HASAP containing the *hasAP* gene (Hyaluronic Acid Synthase) from *Pasteurella multocida* (*pmhasA*) and optimized for the yeast *K. lactis*.

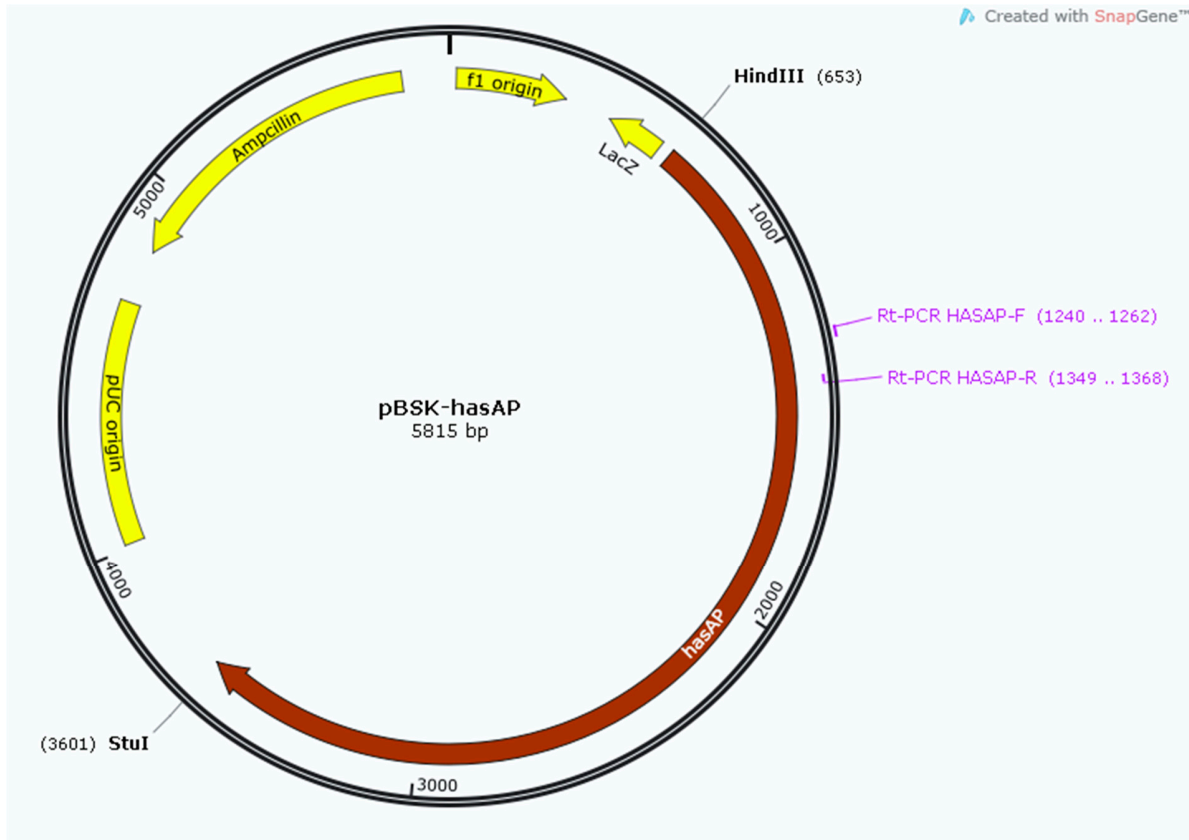


Figure S04. Map of the synthetic plasmid pBSK-HASA1 containing the *hasA1* gene (Hyaluronic Acid Synthase) isoform 1 from *Homo sapiens* (*hshasA1*) and optimized for the yeast *K. lactis*.

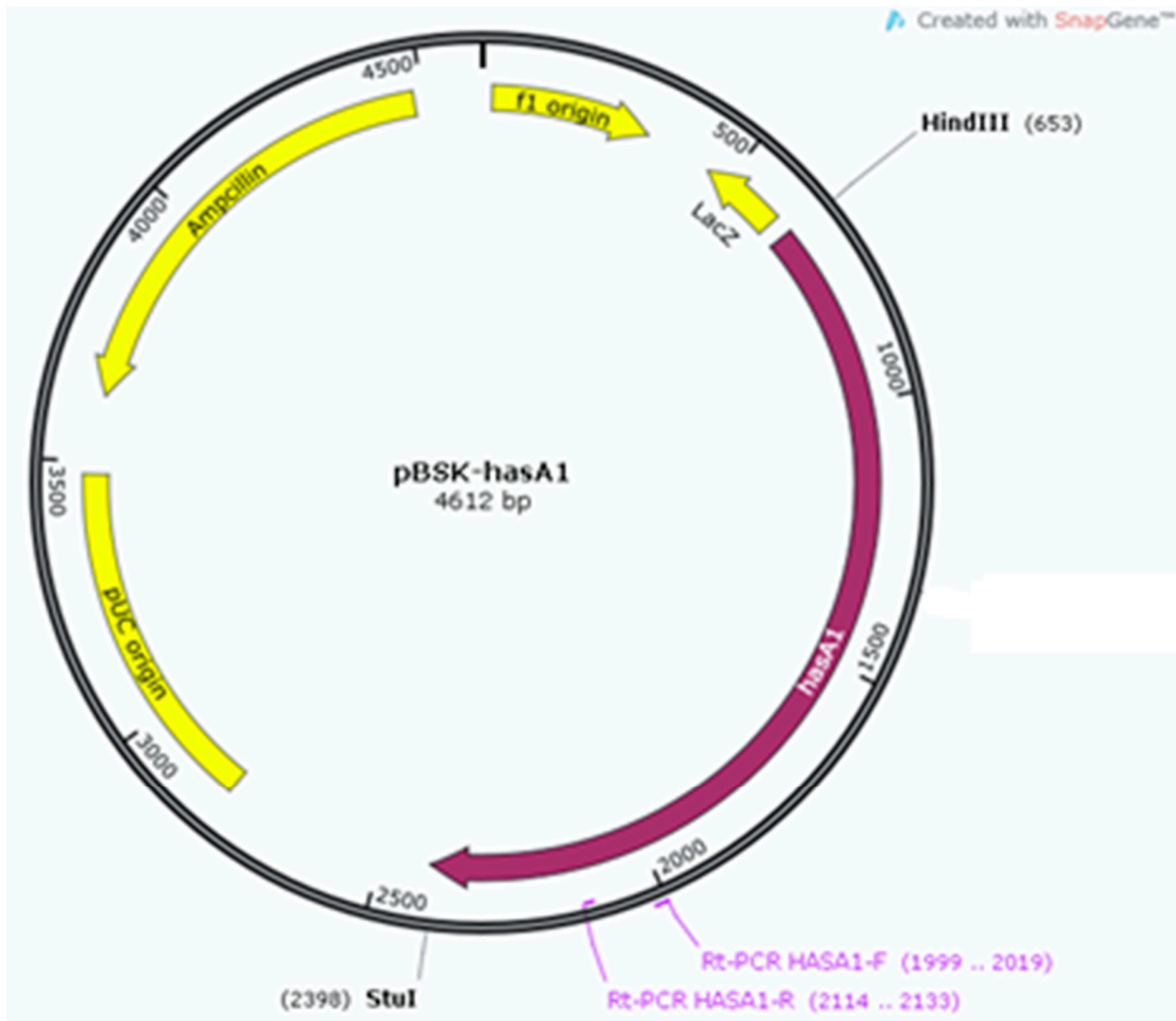


Figure S05. Map of the synthetic plasmid pBSK-HASA2 containing the *hasA2* gene (Hyaluronic Acid Synthase) isoform 2 from *Homo sapiens* (*hshasA2*) and optimized for the yeast *K. lactis*.

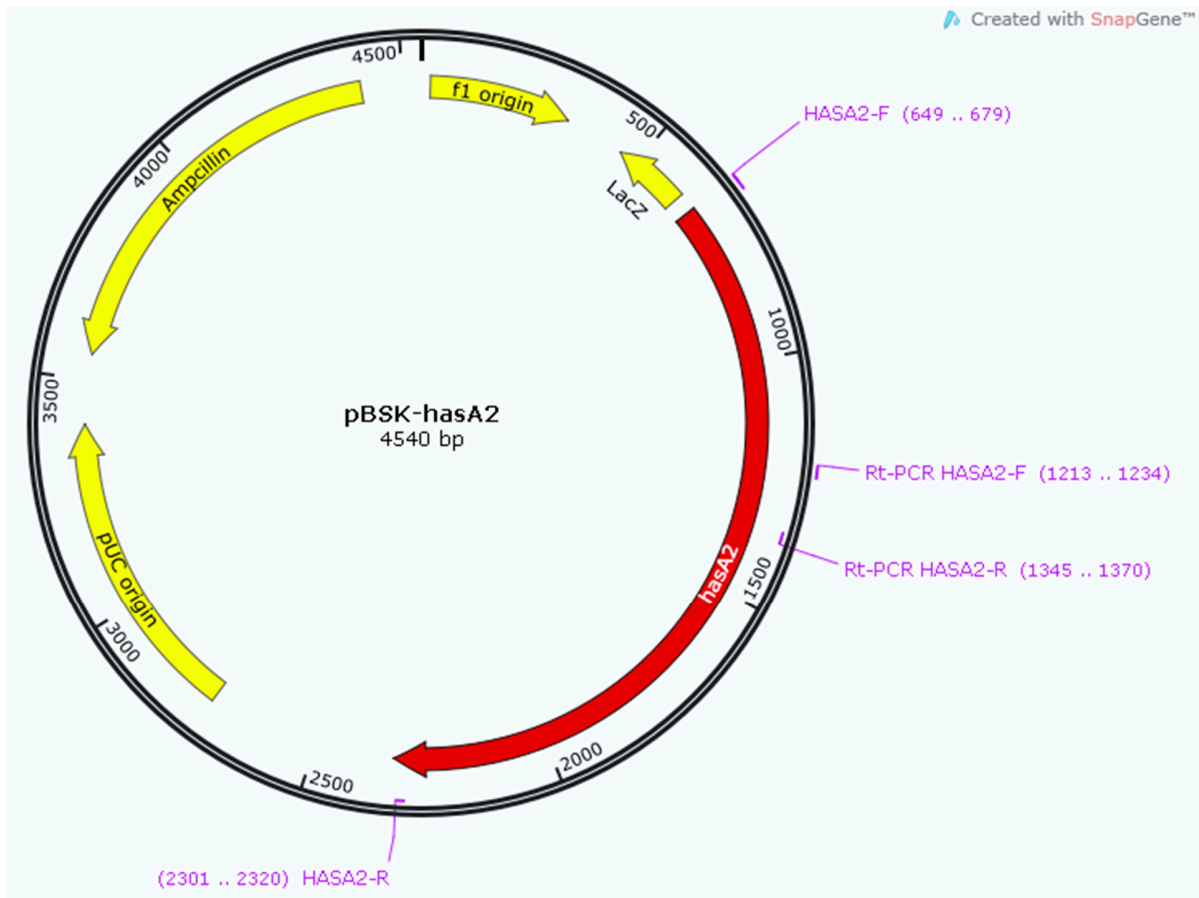


Figure S06. Map of the synthetic plasmid pBSK-HASA3 containing the *hasA3* gene (Hyaluronic Acid Synthase) isoform 3 from *Homo sapiens* (*hshasA3*) and optimized for the yeast *K. lactis*.

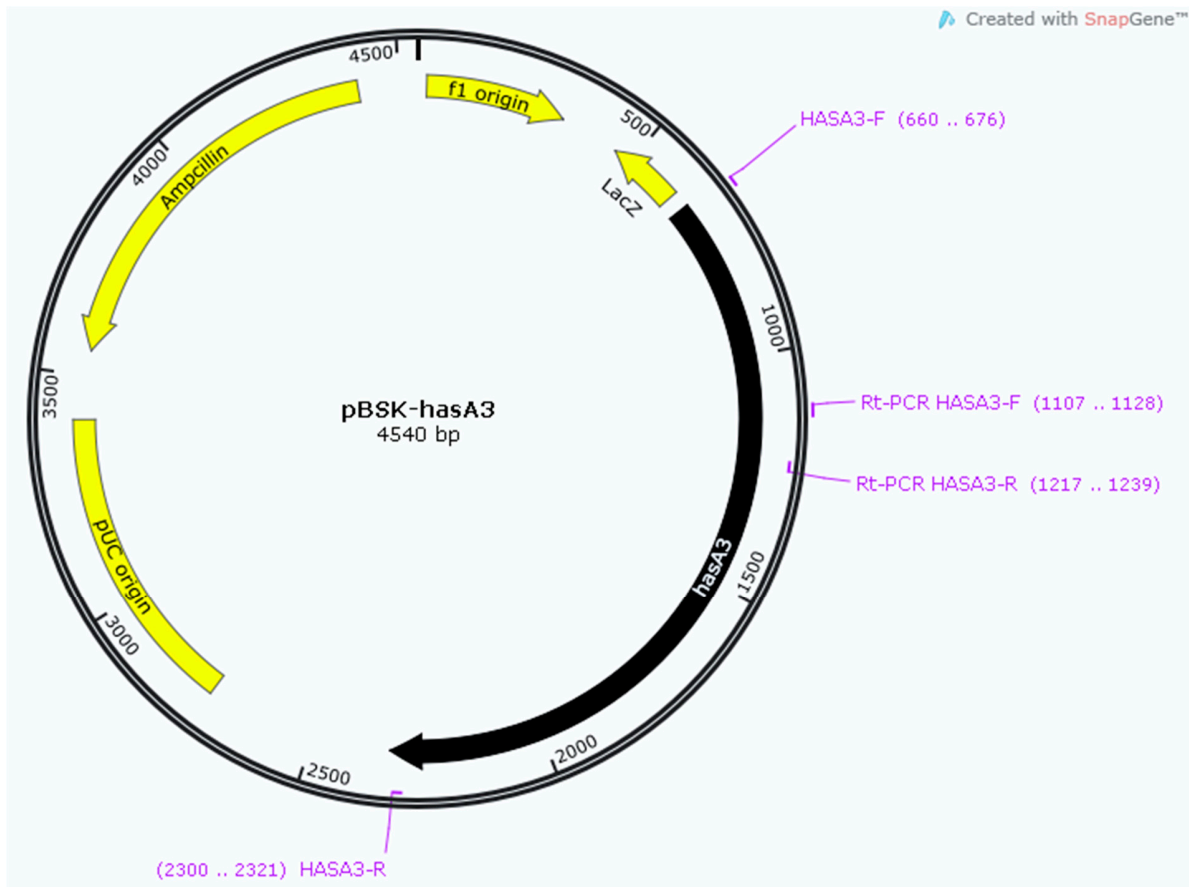


Figure S07. Map of the plasmid pKlac2-B used in this study for integration of the *hasB* gene (UDP-Glucose Dehydrogenase) in genome of *Kluyveromyces lactis*.

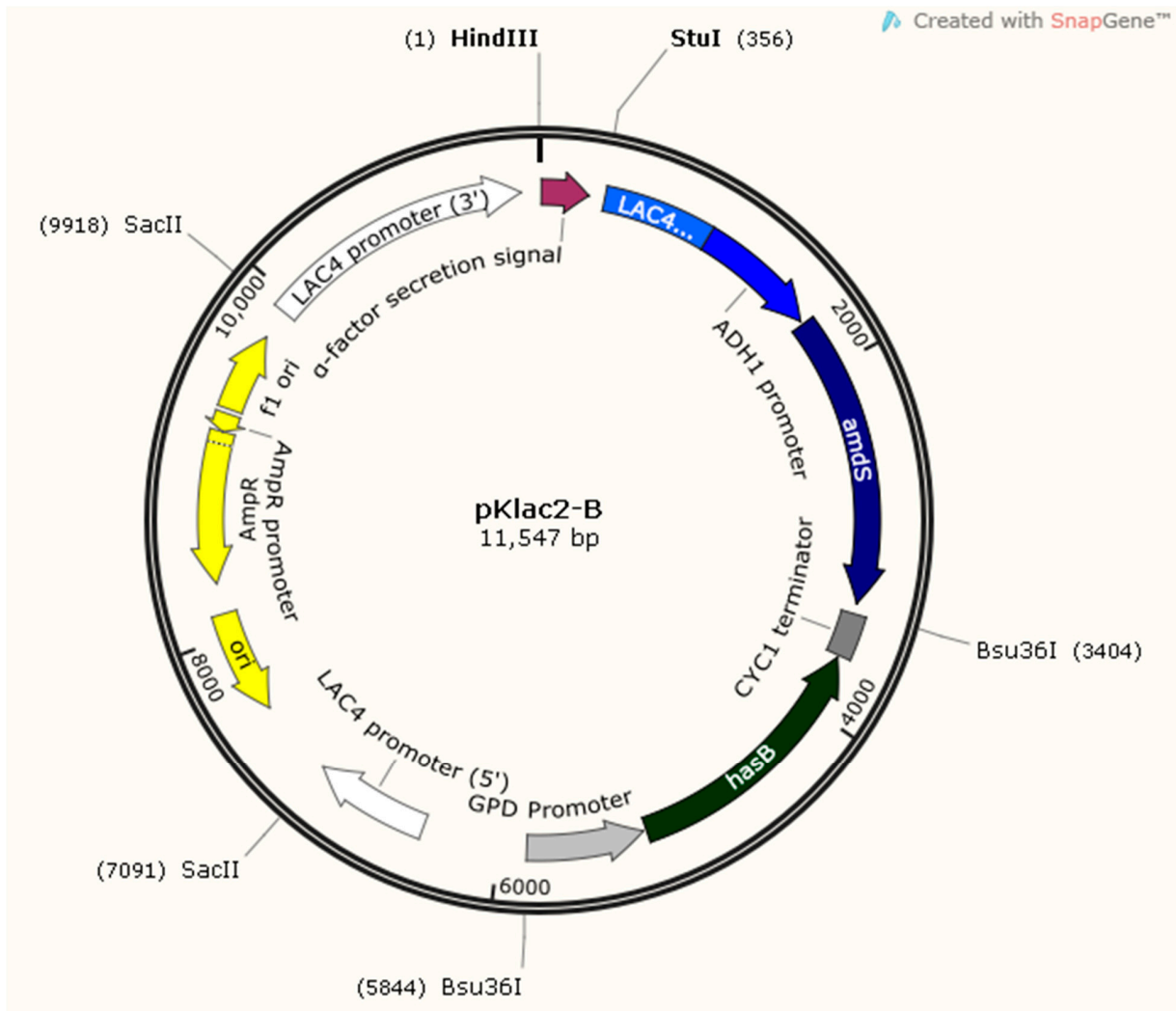


Figure S08. Map of the plasmid pKlac2-BP used in this study for integration of the *hasB* gene (UDP-Glucose Dehydrogenase) from *Xenopus laevis* and *hasAP* gene (Hyaluronic Acid Synthase) from *Pasteurella multocida* in genome of *Kluyveromyces lactis*.

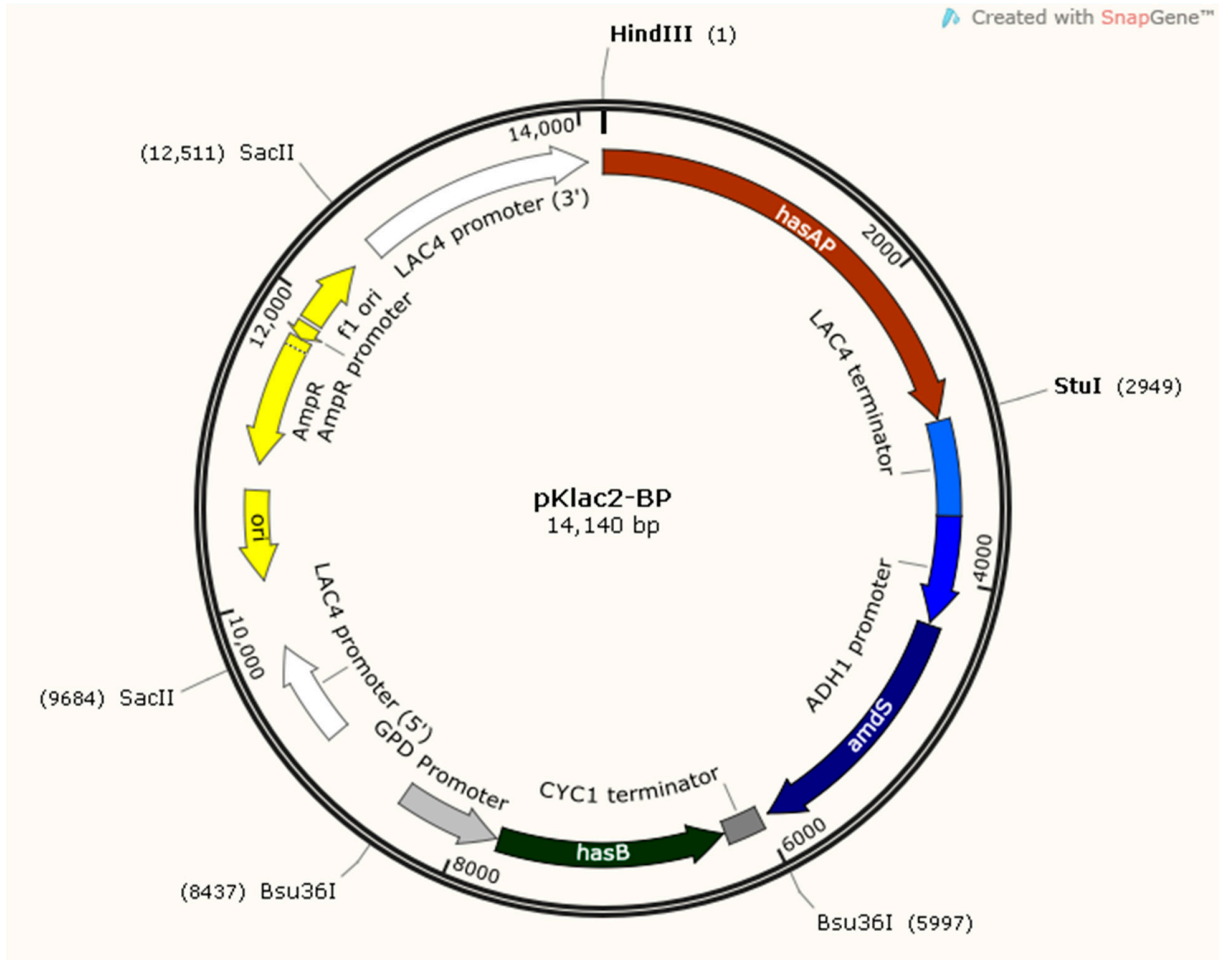


Figure S09. Map of the plasmid pKlac2-B1 used in this study for integration of the *hasB* gene (UDP-Glucose Dehydrogenase) from *Xenopus laevis* and *hasA1* gene (Hyaluronic Acid Synthase) Isoform 1 from *Homo sapiens* in genome of *Kluyveromyces lactis*.

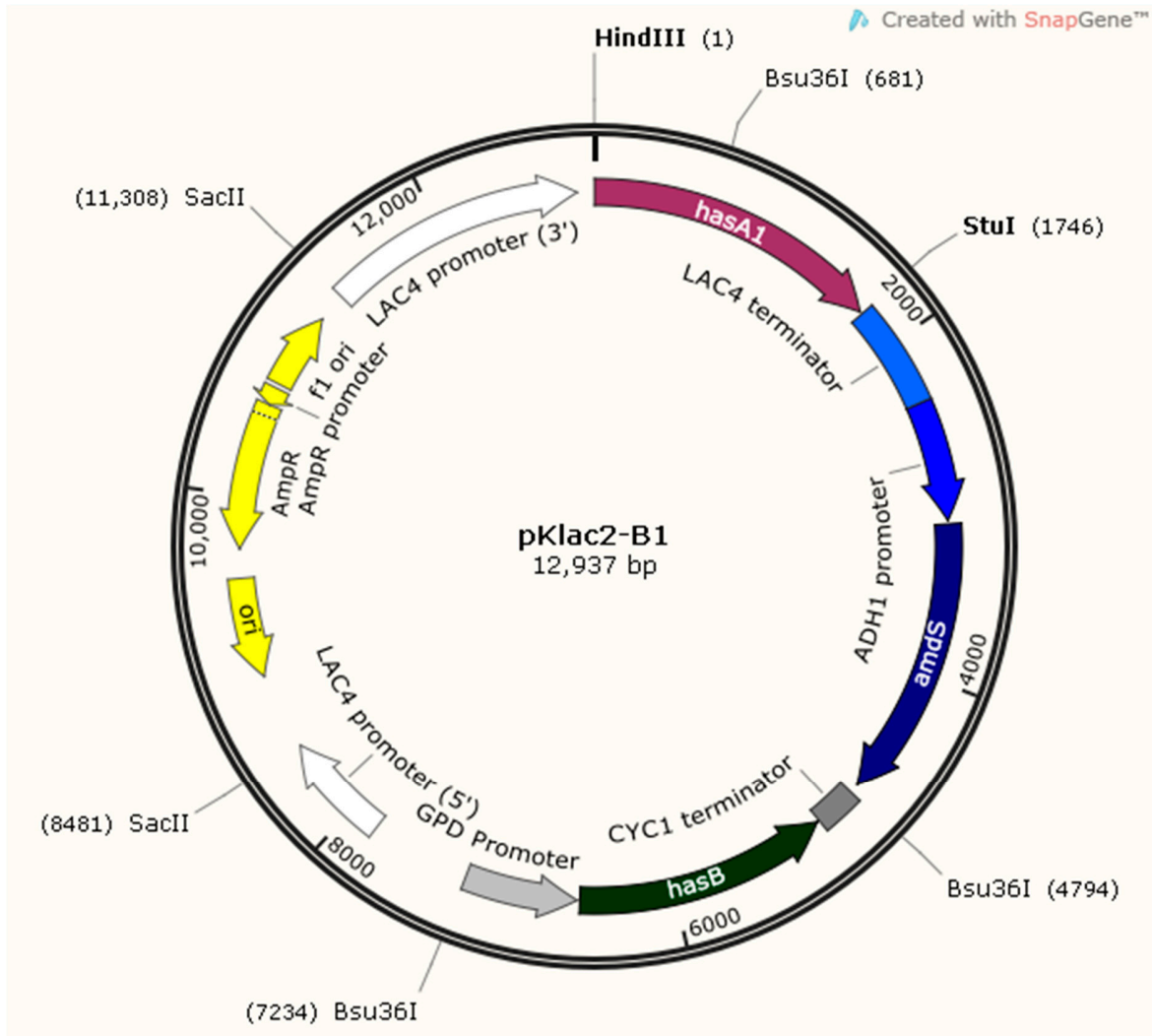


Figure S10. Map of the plasmid pKlac2-B2 used in this study for integration of the *hasB* gene (UDP-Glucose Dehydrogenase) from *Xenopus laevis* and *hasA2* gene (Hyaluronic Acid Synthase) Isoform 2 from *Homo sapiens* in genome of *Kluyveromyces lactis*.

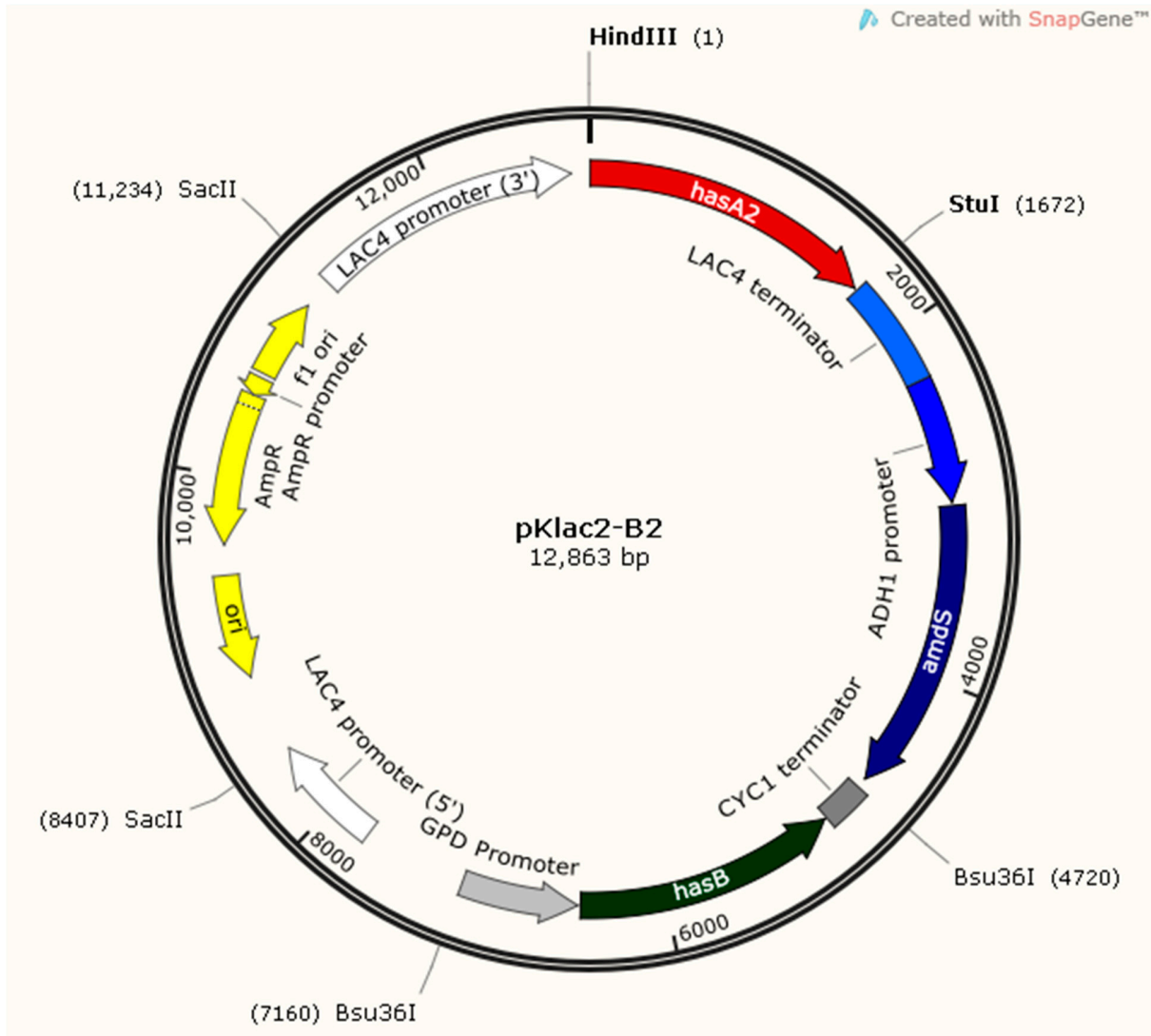
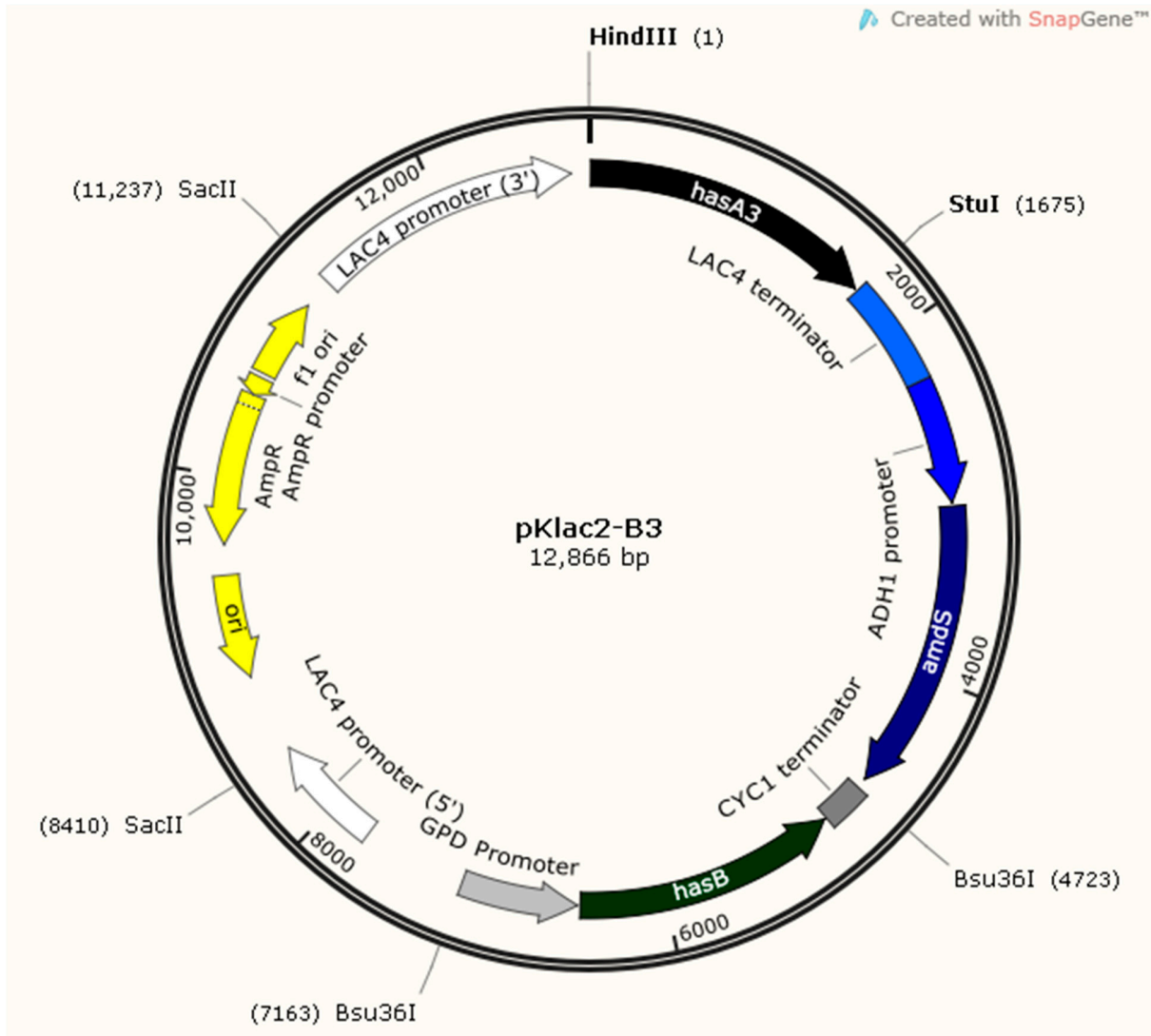


Figure S11. Map of the plasmid pKlac2-B3 used in this study for integration of the *hasB* gene (UDP-Glucose Dehydrogenase) from *Xenopus laevis* and *hasA3* gene (Hyaluronic Acid Synthase) Isoform 3 from *Homo sapiens* in genome of *Kluyveromyces lactis*.



Sequence S01. Sequence of the 4409 PB plasmid pBSK-HASB. The Coding sequence (CDS) of *hasB* gene is highlighted in yellow.

CTGACGCGCCCTGTAGCGGGCGCATTAAAGCGCGGGCGGGTGTGGTGGTTACGCGCAGCGTGACCGCT
ACACTTGCCAGCGCCCTAGCGCCCCTCTTTTCGCTTTCTTCCCTTCCCTTCTCGCCACGTTCCGCC
GCTTTCCCCGTCAAGCTCTAAATCGGGGGCTCCCTTTAGGGTTCCGATTTAGTGCTTTACGGCACCT
CGACCCCAAAAACTTGATTAGGGTGATGGTTCACGTAGTGGGCCATCGCCCTGATAGACGGTTTT
TCGCCCTTTGACGTTGGAGTCCACGTTCTTTAATAGTGGACTCTTGTTCACAACTGGAACAACACT
CAACCCTATCTCGGTCTATTCTTTTGATTTATAAGGGATTTTTGCCGATTTCCGGCCTATTGGTTAAAAA
ATGAGCTGATTTAACAAAAATTTAACGCGAATTTTAAACAAAATATTAACGCTTACAATTTGCCATTC
GCCATTCAGGCTGCGCAACTGTTGGGAAGGGCGATCGGTGCGGGCCTCTTCGCTATTACGCCAGC
TGCGGAAAGGGGGATGTGCTGCAAGGCGATTAAGTTGGGTAACGCCAGGGTTTTCCAGTCACGA
CGTTGTAAAACGACGGCCAGTGAATTGTAATACGACTCACTATAGGGCGAATTGGGTACCGGGCC
CCCCCTCGAGGTCGACTTACACACGTTGCTTCTTGTGTGGCAAGTCCTGTAAACCGAACTTAGGGA
TATCAGCAGTTGGAGTGAATGGTATTCTTTTTGAAGCTACCTTCTTCCGATGGTTTCCACCTGAAA
TCCAATGTTTTGCAATTCTCCATGCAATTCATCTAAAACACGTCTACCATCGAATATGAAAGCAGG
CTTTAACATCATCCTATGGATTCTATTGAAATCTAATTCCTTGAACATATCCCATTAGTACAAATGA
CCATAGCGTGTGCATTCTCACAGGCTTCGTACAAATCTGTACTTATGTGGACCAATTGAGAAACCC
TGTCGTCAGCTGCAACACCAGGTTGACTCAAGTCAGTGATGATCTGCTCACGTGGGACCTTTGGAT
CGTAGATATGTAACCTTAGCACCTTCATCCATCAAATACTTAGAGATATAGATTGAACTACTCTCTCT
AGTATCACCTGTATCCTTCTTGAAAGCGAAACCTAACAATGCGATTTTCTTATCGGTACGGTGTTA
AACAAACAATCGATTATCCTAGTTGTAACACGTCTCCTTTGATAATCATTATCAATCACTTGT
GCCAGTACTTGGCCACTTCGTGCAAGTTTAAACACCTCACACAAGTAAACCAAGTTCAAAAACGTC
TTCTGAAAACATGAACCTCCAAATCCCCTGAAGCCTTCAAAAACCTGTTACCAATTCTTTGATCC
ATACCAATAGCTCTGGCAACCTCTTCAACGTCAGCTCCTGTGGCTTCACATAAGGCACTAATTGAG
TTGATTGAAGAAATTCTTTGAGCTAAGAATGCGTTGGCTGCTAACTTACTCAACTCAGAAGACCAG
GTGTTTGTGGTTATGATTTTCTCAGATGGTACCCAGTGTTCGTATACGTCACACAAAGCTCTAACAG
CTTTCTGACCTTCAGGGGTTTCGTACCCACCTATCAAAACTCTATCAGGGTTCTTCAAATCCTTAAT
GGCTGTACCCTCTGCCAAAACTCTGGGTTACTCAATACCTGCAAGTTCAAATCTGGTTTAGTATTT
GCATCGAAGATACGTCTTATTGATTCAGCAGCTCTAACTGGCACAGTAGATTTCTCTGTAACAATCT
TGTATCCGTTACTATTCTGTAATCTTCTAGCGCAAGCCTCAATGTATTTCAAGTCCGGCTGCCCTT
CCCTTACCATAACCGTAAGTTTTTGTGGAGTGTGACTGAGATGAACACCAAATCAGCTTCTTGA
ATTGCACCATCAATGTCAGTTGAGTAGAACAATCTTTCCCCTGCATGACTCTACGACTTCTTCA
AACCTGGTTCGTAGATAGGCAAAGTGTCACTATTCCAAGCATTGATCCTGGCTTGGTTACATCCA
CAACAGTGACCTTAATGTCAGGGCACATCTGTGCAATGACAGAACAGGTTGGACCACCGACGTA
ACCGGCACCAATACAACAAATCTTCTTGATCTGAAACATTTTTGGATCCACTAGTTCTAGAGCGGC
CGCCACCGCGGTGGAGCTCCAGCTTTTGTCCCTTTAGTGAGGGTTAATTCGAGCTTGGCGTAAT
CATGGTCATAGCTGTTTCTGTGTGAAATTGTTATCCGCTCACAATTCCACACAACATACGAGCCG
GAAGCATAAAGTGTAAGCCTGGGGTGCCTAATGAGTGAGCTAACTCACATTAATTGCGTTGCGC
TCACTGCCCGCTTCCAGTCGGGAAACCTGTCGTGCCAGCTGCATTAATGAATCGGCCAACGCGC
GGGAGAGGCGGTTTGCATATTGGGCGCTCTCCGCTCCTCGCTCACTGACTCGCTGCGCTCGGT
CGTTCCGGCTGCGGCGAGCGGTATCAGCTCACTCAAAGGCGGTAATACGGTTATCCACAGAATCAG
GGGATAACGCAGGAAAGAACATGTGAGCAAAGGCCAGCAAAGGCCAGGAACCGTAAAAAG
GCCGCGTTGCTGGCGTTTTTCCATAGGCTCCGCCCCCTGACGAGCATCACAAAATCGACGCTC
AAGTCAGAGGTGGCGAAACCCGACAGGACTATAAAGATACCAGGCGTTTTCCCCTGGAAGCTCC

CTCGTGCGCTCTCCTGTTCCGACCCTGCCGCTTACCGGATACCTGTCCGCCTTTCTCCCTTCGGGAA
GCGTGCGCTTTCTCATAGCTCACGCTGTAGGTATCTCAGTTCGGTGTAGGTCGTTTCGCTCCAAGCT
GGGCTGTGTGCACGAACCCCCGTTTCAGCCCCGACCCTGCGCCTTATCCGGTAACTATCGTCTTGA
GTCCAACCCGTAAGACACGACTTATCGCCACTGGCAGCAGCCACTGGTAACAGGATTAGCAGA
GCGAGGTATGTAGGCGGTGCTACAGAGTCTTGAAGTGGTGGCCTAACTACGGCTACACTAGAAG
GACAGTATTTGGTATCTGCGCTCTGCTGAAGCCAGTTACCTTCGGAAAAAGAGTTGGTAGCTCTTG
ATCCGGCAAACAAACCACCGCTGGTAGCGGTGGTTTTTTTTGTTTGAAGCAGCAGATTACGCGCA
GAAAAAAAGGATCTCAAGAAGATCCTTTGATCTTTTCTACGGGGTCTGACGCTCAGTGGAAACGAA
AACTCACGTTAAGGGATTTTGGTCATGAGATTATCAAAAAGGATCTTCACCTAGATCCTTTTAAATT
AAAAATGAAGTTTTAAATCAATCTAAAGTATATATGAGTAAACTTGGTCTGACAGTTACCAATGCT
TAATCAGTGAGGCACCTATCTCAGCGATCTGTCTATTTTCGTTTCATCCATAGTTGCCTGACTCCCCGT
CGTGTAGATAACTACGATACGGGAGGGCTTACCATCTGGCCCCAGTGCTGCAATGATACCGCGAG
ACCCACGCTCACCGGCTCCAGATTTATCAGCAATAAACCAGCCAGCCGGAAGGGCCGAGCGCAG
AAGTGGTCTCGCAACTTTATCCGCTCCATCCAGTCTATTAATTGTTGCCGGAAGCTAGAGTAAG
TAGTTCCGCCAGTTAATAGTTTGCGCAACGTTGTTGCCATTGCTACAGGCATCGTGGTGTACAGCTC
GTCGTTTGGTATGGCTTCATTACGCTCCGGTCCCAACGATCAAGGCGAGTTACATGATCCCCAT
GTTGTGCAAAAAAGCGGTTAGCTCCTTCGGTCCCGATCGTTGTCAGAAGTAAGTTGGCCGAG
TGTTATCACTCATGGTTATGGCAGCACTGCATAATTCTCTTACTGTGATGCCATCCGTAAGATGCTTT
TCTGTGACTGGTGAGTACTCAACCAAGTCATTCTGAGAATAGTGTATGCGGCGACCGAGTTGCTCT
TGCCCGGCGTCAATACGGGATAAATACCGCGCCACATAGCAGAACTTTAAAAGTGCTCATCATTGG
AAAACGTTCTTCGGGGCGAAAACCTCTCAAGGATCTTACCGCTGTTGAGATCCAGTTCGATGTAAC
CCACTCGTGACCCAACTGATCTTCAGCATCTTTACTTTTACCAGCGTTTCTGGGTGAGCAAAAA
CAGGAAGGCAAAATGCCGCAAAAAAGGGAATAAGGGCGACACGGAAATGTTGAATACTCATACT
CTTCCTTTTTCAATATTATTGAAGCATTATCAGGGTTATTGTCTCATGAGCGGATACATATTTGAAT
GTATTTAGAAAAATAAACAAATAGGGGTTCCGCGCACATTTCCCCGAAAAGTGCCAC

Sequence S02. Sequence of the 7947 PB plasmid p424-GPD-B. The sequence of GPD Promoter and CYC1 terminator is highlighted in yellow and the coding sequence of *hasB* gene is highlighted in gray.

TCGCGCGTTTTCCGGTATGACGGTGAAAACCTCTGACACATGCAGCTCCCGGAGACGGTACAGCT
TGTCTGTAAGCGGATGCCGGGAGCAGACAAGCCCGTCAGGGCGCGTCAGCGGGTGTGGCGGGT
GTCGGGGCTGGCTTAACTATGCGGCATCAGAGCAGATTGTACTGAGAGTGACCATAAACGACAT
TACTATATATATAATATAGGAAGCATTAAATAGACAGCATCGTAATATATGTGTACTTTGCAGTTATG
ACGCCAGATGGCAGTAGTGGAAGATATTCTTTATTGAAAAATAGCTTGTACCTTACGTACAATCT
TGATCCGGAGCTTTTCTTTTTTTGCCGATTAAGAATTAATTCGGTCGAAAAAAGAAAAGGAGAGG
GCCAAGAGGGAGGGCATTGGTGACTATTGAGCACGTGAGTATACGTGATTAAGCACACAAAGGC
AGCTTGGAGTATGTCTGTTATTAATTTACAGGTAGTTCTGGTCCATTGGTGAAAGTTTGGCGCTTG
CAGAGCACAGAGGCCGAGAATGTGCTCTAGATTCCGATGCTGACTTGCTGGGTATTATATGTGTG
CCCAATAGAAAGAGAACAATTGACCCGGTTATTGCAAGGAAAATTTCAAGTCTTGTAAGCATA
TAAAAATAGTTCAGGCACTCCGAAATACTTGGTTGGCGTGTTCGTAATCAACCTAAGGAGGATGT
TTTGGCTCTGGTCAATGATTACGGCATTGATATCGTCCAACCTGCATGGAGATGAGTCGTGGCAAGA
ATACCAAGAGTTCCTCGGTTTGGCAGTTATTAAGACTCGTATTTCCAAAAGACTGCAACATACT
ACTCAGTGCAGCTTCACAGAAACCTCATTTCGTTTATTCCCTTGTTTGATTGAGAAGCAGGTGGGAC

AGGTGAACTTTTGGATTGGAAGCTGATTTCTGACTGGGTGGAAGGCAAGAGAGCCCCGAAAGCT
TACATTTTATGTTAGCTGGTGGACTGACGCCAGAAAATGTTGGTGATGCGCTTAGATTAATGGCG
TTATTGGTGTGATGTAAGCGGAGGTGTGGAGACAAATGGTGTAAGAACTCTAACAAAATAGCA
AATTTTCGTCAAAATGCTAAGAAATAGGTTATTACTGAGTAGTATTTATTTAAGTATTGTTTGTGCAC
TTGCCTATGCGGTGTGAAATACCGCACAGATGCGTAAGGAGAAAATACCGCATCAGGAAATTGTA
AACGTTAATATTTTGTAAATTCGCGTTAAATTTTGTAAATCAGCTCATTTTTAAACCAATAGGC
CGAAATCGGCAAAATCCCTTATAAATCAAAGAATAGACCGAGATAGGGTTGAGTGTGTTCCAG
TTTGGAAACAAGAGTCCACTATTAAGAACGTGGACTCCAACGTCAAAGGGCGAAAACCGTCTA
TCAGGGCGATGGCCACTACGTGAACCATCACCTAATCAAGTTTTTTGGGGTTCGAGGTGCCGTA
AAGCACTAAATCGGAACCCTAAAGGGAGCCCCGATTTAGAGCTTGACGGGGAAAGCCGGCGAA
CGTGCGGAGAAAGGAAGGGAAAGCGAAAGGAGCGGGCGCTAGGGCGCTGGCAAGTGTAG
CGGTCACGCTGCGCGTAACCACCACACCCGCCGCGCTTAATGCGCCGCTACAGGGCGCGTCGCGC
CATTGCGCATTGAGGCTGCGCAACTGTTGGGAAGGGCGATCGGTGCGGGCCTCTTCGCTATTACGC
CAGCTGGCGAAAGGGGATGTGCTGCAAGGCGATTAAGTTGGGTAACGCCAGGGTTTTCCAGTC
ACGACGTTGTAACGACGGCCAGTGAGCGCGGTAATACGACTCACTATAGGGCGAATTGGGTA
CCGGCCGCAAATTAAGCCTTCGAGCGTCCCAAAACCTTCTCAAGCAAGTTTTTCAGTATAATGTT
ACATGCGTACACGCGTCTGTACAGAAAAAAGAAAAATTTGAAATATAAATAACGTTCTTAATA
CTAACATAACTATAAAAAAATAAATAGGGACCTAGACTTCAGGTTGTCTAACTCCTTCTTTTCGGT
TAGAGCGGATGTGGGGGAGGGCGTGAATGTAAGCGTGACATAACTAATTACATGACTCGAGGTC
GACTTACACACGTTGCTTCTGTGTGGCAAGTCCTGTAAACCGAACTTAGGGATATCAGCAGTTGG
AGTGAATGGTATTCTTTTTGAAGCTACCTTCTTTCCGATGGTTCCACCTGAAATCCAATGTTTTGCA
ATTCTCCATGCAATTCATCTAAAACACGTCTACCATCGAATATGAAAGCAGGCTTTAACATCATCCT
ATGGATTCTATTGAAATCTAATTCCTGAACATATCCCATTGAGTACAAATGACCATAGCGTGTGCA
TTCTCACAGGCTTCGTACAAATCTGTAATGTTGACCAATTGAGAAACCTGTGCTCAGCTGCA
ACACCAGGTTGACTCAAGTCAGTGATGATCTGCTCACGTGGGACCTTTGGATCGTAGATATGTAAC
TTAGCACCTTCATCCATCAAATACTTAGAGATATAGATTGAACTACTCTCTAGTATCACCTGTATC
CTTCTTGAAGCGAAACCTAACAAATGCGATTTTCTTATCGGTCACGGTGTAAACAAACAATCGAT
TATCCTAGTTGTAACCGTCTCCTTTGATAATCATTATATCAATCACTTGTGCCAGTACTTGGCCA
CTTCGTGCAAGTTAACACCTCACACAAGTAAACCAAGTTCAAACGTCCTTCTGAAAACATGAA
CCTCCAAATCCACTGAAGCCTTCAAAAACCTGTTACCAATTCTTTGATCCATAACCAATAGCTCTG
GCAACCTCTTCAACGTCAGCTCCTGTGGCTTACATAAGGCACTAATTGAGTTGATTGAAGAAAT
CTTTGAGCTAAGAATGCGTTGGCTGCTAACTTACTCAACTCAGAAGACCAGGTGTTTGTGGTTATG
ATTTTCTCAGATGGTACCCAGTGTTCGTATACGTCACACAAAGCTCTAACAGCTTTCTGACCTTCAG
GGTTTTGCTCACCACTATCAAACTCTATCAGGGTTCTTCAAATCCTTAATGGCTGTACCCTCTGC
CAAAAACCTCTGGTTACTCAATACCTGCAAGTTCAAATCTGGTTTAGTATTTGCATCGAAGATACG
TCTTATTGATTCAGCAGCTCTAACTGGCACAGTAGATTTCTCTGTAACAATCTTGTATCCGTTACTAT
TCTGTAATTTCTTCTAGCGCAAGCCTCAATGATTTCAAGTCGGCTGCCCTTCCCTTACCCATACC
GTAAGTTTTTGTGGAGTGTGACTGAGATGAACACCAATCAGCTTCTTGAATTGCACCATCAAT
GTCAGTTGAGTAGAACAAATCTTTCCCTGCATGACTCTACGACTTCTTCAAACCTGGTTCGTA
GATAGGCAAAGTGCACATTTCCAAGCATTGATCCTGGCTTGGTTCACATCCACAACAGTGACCTT
AATGTCAGGGCACATCTGTGCAATGACAGAACAGGTTGGACCACCGACGTAACCGGCACCAATA
CAACAAATCTTCTGATCTGAAACATTTTTGGATCCACTAGTTCTAGATCCGTCGAAACTAAGTTCT
TGGTGTTTTAAACTAAAAAAGACTAATAAAAGTAGAATTTAAGAAGTTAAGAAATAGA
TTTACAGAATTACAATCAATACCTACCGTCTTTATATACTTATTAGTCAAGTAGGGGAATAATTCAG

GGAACTGGTTTAAACCTTTTTTTTTCAGCTTTTTTCCAAATCAGAGAGAGCAGAAGGTAATAGAAGGT
GTAAGAAAATGAGATAGATACATGCGTGGGTCAATTGCCTTGTCATCATTTACTCCAGGCAGGT
TGCATCACTCCATTGAGGTTGTGCCGTTTTTTGCTGTTTGTGCCCTGTTCTCTGTAGTTGCGCTAA
GAGAATGGACCTATGAACTGATGGTTGGTGAAGAAAACAATATTTTGGTGCTGGGATTCTTTTTTT
TCTGGATGCCAGCTTAAAAAGCGGGCTCCATTATATTTAGTGGATGCCAGGAATAAACCTGTTTAC
CCAAGCACCATCAGTGTATATATTCTGTGTAACCCGCCCTATTTGGCATGTACGGGTTACAGC
AGAATTAAGGCTAATTTTTTACTAAATAAAGTTAGGAAAATCACTACTATTAATTATTTACGTA
TTCTTTGAAATGGCAGTATTGATAATGATAAACTCGAGAGCTCCAGCTTTTGTCCCTTTAGTGAGG
GTTAATTGCGCGCTTGGCGTAATCATGGTCATAGCTGTTTCCCTGTGTGAAATTGTTATCCGCTCACA
ATTCCACACAACATAGGAGCCGGAAGCATAAAGTGTAAGCCTGGGGTGCCTAATGAGTGAGGT
AACTCACATTAATTGCGTTGCGCTCACTGCCCGTTTTCCAGTCGGGAAACCTGTCGTGCCAGCTGC
ATTAATGAATCGGCCAACGCGCGGGGAGAGGCGGTTTGCCTATTGGGCGCTCTTCCGCTTCCCTCGC
TCACTGACTCGCTGCGCTCGGTTCGTTCCGCTGCGGCGAGCGGTATCAGTCACTCAAAGGCGGTA
ATACGGTTATCCACAGAATCAGGGGATAACGCAGGAAAGAACATGTGAGCAAAAAGGCCAGCAA
AAGGCCAGGAACCGTAAAAAGGCCGCGTTGCTGGCGTTTTTCCATAGGCTCCGCCCCCTGACGA
GCATCACAAAATCGACGCTCAAGTCAGAGGTGGCGAAACCCGACAGGACTATAAAGATAACAG
GCGTTTCCCCCTGGAAGCTCCCTCGTGCGCTCTCCTGTTCCGACCCTGCCGCTTACCGGATACCTGT
CCGCCTTTCTCCCTTCGGGAAGCGTGCGCTTTCTCATAGCTCACGCTGTAGGTATCTCAGTTCGGT
GTAGGTCGTTTCGCTCCAAGCTGGGCTGTGTGCACGAACCCCGTTTCCAGCCCGACCGCTGCGCCT
TATCCGGTAACTATCGTCTTGAGTCCAACCCGTAAGACACGACTTATCGCCACTGGCAGCAGCC
ACTGGTAACAGGATTAGCAGAGCGAGGTATGTAGGCGGTGCTACAGAGTCTTGAAGTGGTGGCC
TAACTACGGCTACACTAGAAGGACAGTATTTGGTATCTGCGCTCTGCTGAAGCCAGTTACCTTCGG
AAAAAGAGTTGGTAGCTCTTGATCCGGCAAACAACCACCGCTGGTAGCGGTGGTTTTTTTTGTTT
CAAGCAGCAGATTACGCGCAGAAAAAAGGATCTCAAGAAGATCCTTTGATCTTTTCTACGGGT
CTGACGCTCAGTGGAACGAAAACCTCACGTTAAGGGATTTTGGTTCATGAGATTATCAAAAAGGATC
TTCACCTAGATCCTTTTAAATTAATAAATGAAGTTTTAAATCAATCTAAAGTATATATGAGTAAACTT
GGTCTGACAGTTACCAATGCTTAATCAGTGAGGCACCTATCTCAGCGATCTGTCTATTTTCGTTTATC
CATAGTTGCCTGACTCCCCGTCGTGTAGATAACTACGATACGGGAGGGCTTACCATCTGGCCCCAG
TGCTGCAATGATACCGCGAGACCCACGCTCACCGGCTCCAGATTTATCAGCAATAAACAGCCAG
CCGGAAGGGCCGAGCGCAGAAGTGGTCTGCAACTTTATCCGCCTCCATCCAGTCTATTAATTGTT
GCCGGGAAGCTAGAGTAAGTAGTTCGCCAGTTAATAGTTTTCGCAACGTTGTTGCCATTGCTACAG
GCATCGTGGTGTACGCTCGTCTGTTTGGTATGGCTTCATTACGCTCCGGTCCCAACGATCAAGGC
GAGTTACATGATCCCCATGTTGTGCAAAAAGCGGTTAGCTCCTTCGGTCTCCGATCGTTGTCA
GAAGTAAGTTGGCCGAGTGTATCACTCATGGTTATGGCAGCACTGCATAATTCTTACTGTAT
GCCATCCGTAAGATGCTTTTCTGTGACTGGTACTCAACCAAGTCATTCTGAGAATAGTGTAT
GCGGCGACCGAGTTGCTCTTGCCCGGCGTCAATACGGGATAATACCGCGCCACATAGCAGAACTT
TAAAAGTGCTCATCATTGGAAAACGTTCTTCGGGGCGAAAACCTCTCAAGGATCTTACCGCTGTTG
AGATCCAGTTCGATGTAACCCACTCGTGACCCAACTGATCTTACGATCTTTTACTTTACCAGC
GTTTCTGGGTGAGCAAAAACAGGAAGGCAAAATGCCGCAAAAAGGGAATAAGGGCGACACGG
AAATGTTGAATACTCATACTCTTCTTTTTCAATATTATTGAAGCATTATCAGGGTTATTGTCTCATG
AGCGGATACATATTTGAATGTATTTAGAAAAATAAACAATAGGGGTTCCGCGCACATTTCCCCGA
AAAGTGCCACCTGAACGAAGCATCTGTGCTTCATTTTGTAGAACAAAAATGCAACGCGAGAGCG
CTAATTTTTCAAACAAGAATCTGAGCTGCATTTTTACAGAACAGAAATGCAACGCGAAAGCGCT
ATTTTACCAACGAAGAATCTGTGCTTCATTTTTGTAAAACAAAAATGCAACGCGAGAGCGCTAATT

TTTCAAACAAAGAATCTGAGCTGCATTTTTACAGAACAGAAATGCAACGCGAGAGCGCTATTTTAA
CCAACAAAGAATCTATACTTCTTTTTTGTCTACAAAAATGCATCCCGAGAGCGCTATTTTTCTAAC
AAAGCATCTTAGATTACTTTTTTCTCCTTGTGCGCTCTATAATGCAGTCTCTTGATAACTTTTTGCA
CTGTAGGTCCGTTAAGGTTAGAAGAAGGCTACTTTGGTGTCTATTTTCTCTCCATAAAAAAGCCT
GACTCCACTTCCCGCGTTTACTGATTACTAGCGAAGCTGCGGGTGCATTTTTCAAGATAAAGGCA
TCCCGATTATATTCTATAACCGATGTGGATTGCGCATACTTTGTGAACAGAAAGTGATAGCGTTGAT
GATTCTTCATTGGTCAGAAAATTATGAACGGTTTCTTCTATTTTGTCTCTATATACTACGTATAGGAA
ATGTTTACATTTTCGTATTGTTTTCGATTCACTCTATGAATAGTTCTTACTACAATTTTTTTGTCTAAA
GAGTAATACTAGAGATAAACATAAAAAATGTAGAGGTGCGAGTTTAGATGCAAGTTCAAGGAGCGA
AAGGTGGATGGGTAGGTTATATAGGGATATAGCACAGAGATATATAGCAAAGAGATACTTTTGAGC
AATGTTTGTGGAAGCGGTATTCGCAATATTTTAGTAGCTCGTTACAGTCCGGTGCCTTTTTGGTTTTT
TGAAAGTGCGTCTTCAGAGCGCTTTTGGTTTTCAAAGCGCTCTGAAGTTCCTATACTTTCTAGAG
AATAGGAACTTCGGAATAGGAACTTCAAAGCGTTTCCGAAAACGAGCGCTTCCGAAAATGCAAC
GCGAGCTGCGCACATACAGCTCACTGTTACGTCGCACCTATATCTGCGTGTTCCTGTATATATAT
ATACATGAGAAGAACGGCATAAGTGCCTGTTTATGCTTAAATGCGTACTTATATGCGTCTATTTATGTA
GGATGAAAGGTAGTCTAGTACCTCCTGTGATATTATCCCATTCCATGCGGGGTATCGTATGCTTCCTT
CAGCACTACCCTTAGCTGTTCTATATGCTGCCACTCCTCAATTGGATTAGTCTCATCCTTCAATGCT
ATCATTTCCTTTGATATTGGATCATATTAAGAAACCATTATTATCATGACATTAACCTATAAAAAATAG
GCGTATCACGAGGCCCTTTCGTC

Sequence S03. Sequence of the 5815 PB plasmid pBSK-HASAP. The sequence of the coding Sequence of *hasAP* gene is highlighted in yellow.

CTGACGCGCCCTGTAGCGGCGCATTAAAGCGCGGGCGGGTGTGGTGGTTACGCGCAGCGTGACCGCT
ACACTTGCCAGCGCCCTAGCGCCCGCTCCTTTCGCTTTCTTCCCTTCCCTTCTCGCCACGTTCCGCCG
GCTTTCCCGTCAAGCTCTAAATCGGGGGCTCCCTTATAGGTTCCGATTTAGTGCTTTACGGCACCT
CGACCCCAAAAACTTGATTAGGGTGATGGTTCACGTAGTGGGCCATCGCCCTGATAGACGGTTTT
TCGCCCTTTGACGTTGGAGTCCACGTTCTTAAATAGTGGACTCTTGTTCAAAACCTGGAACAACACT
CAACCCTATCTCGGTCTATTCTTTTATTATAAGGGATTTTGGCGATTTCCGGCCTATTGGTTAAAAA
ATGAGCTGATTTAACAAAAATTTAACGCGAATTTTAAACAAAATATTAACGCTTACAATTTGCCATTC
GCCATTCAGGCTGCGCAACTGTTGGGAAGGGCGATCGGTGCGGGCCTCTTCGCTATTACGCCAGC
TGCGGAAAGGGGGATGTGCTGCAAGGCGATTAAGTTGGGTAACGCCAGGGTTTTCCAGTCACGA
CGTTGTAACGACGCGCCAGTGAATTGTAATACGACTCACTATAGGGCGACCTTTAAGCTTATGA
ATACCTTATCTCAAGCCATCAAGGCATACAATTCAAATGACTATCAATTGGCTTTGAAATTGTTCGA
AAAGTCAGCAGAAATCTACGGACGTAAGATAGTAGAGTTTTCAGATTACTAAGTGAAGGAGAAAT
TGTCTGCCCATCCAAGTGTCAATTGAGCTCATCCTTCAGTCAACTCAGCACATTTGTCAGTAAACA
AAGAGGAAAAGGTTAATGTGTGCGATTCTCCATTGGATATTGCTACCCAATTGTTGTTGTCAAATGT
CAAGAAATTAGTGTATCTGACAGTGAGAAGAACACATTGAAGAATAAGTGAAGTTGTTAACTG
AAAAGAAAAGTGAGAATGCTGAAGTTCGTGCTGTAGCATTGGTACCAAAGGATTTCCCAAAGGAT
TTGGTGTGGCACCATTACCTGACCATGTGAATGACTTTACTTGGTACAAGAAGAGAAAGAAACG
TTTAGGTATCAAACCAGAACATCAACACGTGGGTTTGTCAATAATTGTCACCCTTTCAATCGTCC
TGCAATCTTAAGTATAACTTTGGCATGCTTAGTTAATCAAAGACTCACTATCCATTCGAGGTGATT
GTCACAGATGATGGATCACAAGAAGATTTGTCTCCAATCATAAGACAATATGAAAACAAATTGGA
TATCCGTTATGTCAGACAAAAGGACAATGGTTTCCAAGCTAGTGCTGCTAGGAATATGGGTTTGGAG
ATTAGCAAAGTATGATTTCAATTGGTTTGTGGATTGCGATATGGCACCTAACCCATTATGGGTGCATT

CATATGTCGCTGAATTGTTAGAAGATGATGATTTGACAATCATTGGACCAAGAAAGTACATTGATA
CACAACATATCGACCCAAAGGACTTCTTAAACAATGCATCTTTGTTGGAATCATTGCCAGAAGTTA
AGACCAATAACTCAGTGGCCGCAAAAGGTGAAGGTACCGTTTCATTGGATTGGAGGTTGGAGCA
ATTCGAAAAGACTGAAAACCTAAGATTGTCAGACTCTCCTTTTAGATTCTTCGCAGCTGGTAATGT
TGCTTTCGCCAAGAAGTGGTTGAACAAATCTGGATTCTTTGATGAAGAGTTCAACCATTGGGGTGG
TGAAGATGTTGAGTTTGGATATAGATTGTTTAGGTATGGTTCATTCTTCAAGACTATTGACGGTATCA
TGGCCTACCATCAAGAGCCACCTGGTAAGGAAAACGAAACAGATAGGGAAGCTGGAAAGAACA
TCACATTGGATATTATGAGGGAGAAGGTACCATATATTTACAGGAAGTTGTTGCCTATCGAAGATTC
ACACATCAATAGAGTCCCTTTGGTTTCTATCTATATCCCAGCTTACAACCTGTGCCAATTATATTCAAC
GTTGTGTTGATTCTGCCTTGAACCAGACAGTTGTAGATTTGGAAGTCTGTATTTGCAATGATGGTTC
TACAGATAATACTTTGGAAGTTATCAACAAGTTGTACGGTAACAATCCAAGAGTCAGAATCATGA
GTAAACCAAATGGTGGTATTGCTAGTGCTTCTAATGCAGCAGTGAGTTTTGCCAAAGGATATTACA
TAGGTCAATTAGATTGAGATGACTATTTGGAGCCAGATGCCGTAGAGTTATGTTTGAAAGAGTTCTT
GAAAGACAAAACCTTTGGCTTGTGTATATACAACAACAGAAATGTCAATCCTGATGGTCTTTGAT
AGCAAATGGTTACAACCTGGCCAGAGTTTAGTAGGGAGAAGTTGACTACTGCAATGATTGCTCATC
ACTTCCGTATGTTCACTATCAGGGCATGGCATTGACCGATGGTTTTAATGAGAAGATTGAGAATG
CTGTGGACTACGATATGTTCTTGAAGTTGAGTGAAGTTGGTAAGTTCAAGCACTTAAACAAAATCT
GCTATAACAGGGTATTGCATGGTGATAATACAAGTATTAAGAAGTTGGGTATCCAAAAGAAGAAC
CATTTTCGTGGTCGTCAACCAGAGTTGAACAGGCAAGGAATCACTTACTACAATTACGACGAGTT
CGATGACTTAGATGAGTCTAGGAAATACATCTTTAACAACAACAGCTGAGTACCAGGAAGAAATTG
ACATCTTAAAGGACATTAAGATCATACAAAAACAAGGACGCTAAAATAGCAGTATCTATCTTCTACC
CAAATACTTTGAATGGTTTGGTCAAGAAATTGAATAACATCATCGAGTACAACAAGAACATATTCCG
TTATTGTCTTGCATGTGGACAAGAACCATTTGACCCAGATATCAAGAAAGAGATATTGGCTTTCT
ACCACAAGCATCAAGTGAATATTTTGTGAATAACGATATCTCATACTACACATCAAACCGTTTAAAT
CAAGACCGAGGCACATTTATCAAACATTAATAAGTTGTACAGTTGAACTTGAATTGTGAATATAT
CATATTCGACAATCATGACTCTTTGTTTCGTGAAGAATGATTCTTATGCCTATATGAAGAAGTACGAT
GTTGGTATGAATTTCTCAGCCTTAACTCATGATTGGATTGAAAAGATTAACGCACATCCACCATTCA
AGAAGTTGATTAAGACATACTTTAACGATAATGACTTGAATCTATGAACGTTAAAGGAGCTAGTC
AAGGAATGTTTATGACATATGCATTGGCTCACGAATTGTTGACTATTATCAAAGAGGTTATCACTTC
TTGCCAATCTATCGATTCTGTACCAGAATACAACACTGAGGACATATGGTTTCAATTTGCATTGTTG
ATCTTGGAAAAGAAAACCTGGTCATGTCTTTAACAAGACAAGTACCTTGACATACATGCCTTGGGA
GAGGAAGTTGCAATGGACCAATGAACAAATTGAATCAGCTAAACGTGGAGAAAACATTCCAGTG
AACAAGTTCATAATCAATTCAATCACATTGTAAAGGCCTAAAGGGGATATCCTCGAGGTTCCCTTT
AGTGAGGGTTAATTGCGAGCTTGGCGTAATCATGGTCATAGCTGTTTCCTGTGTGAAATTGTTATCC
GCTCACAATTCCACACAACATACGAGCCGGAAGCATAAAGTGTAAGCCTGGGGTGCCTAATGA
GTGAGCTAACTCACATTAATTGCGTTGCGCTCACTGCCCCGCTTCCAGTCGGGAAACCTGTCGTGC
CAGCTGCATTAATGAATCGGCCAACCGCGGGGAGAGGCGGTTTGGCTATTGGGCGCTCTCCGC
TTCCTCGCTCACTGACTCGCTGCGCTCGGTCGTTTCGGCTGCGGCGAGCGGTATCAGCTCACTCAA
GGCGGTAATACGGTTATCCACAGAATCAGGGGATAACGCAGGAAAGAACATGTGAGCAAAAAGGC
CAGCAAAAAGGCCAGGAACCGTAAAAGGCCGCGTTCGTTGGCGTTTTTCCATAGGCTCCGCCCCCC
TGACGAGCATCACA AAAATCGACGCTCAAGTCAGAGGTGGCGAAACCCGACAGGACTATAAAG
ATACCAGGCGTTTCCCCCTGGAAGCTCCCTCGTGCGCTCTCCTGTTCCGACCTGCCGCTTACCGG
ATACCTGTCCGCTTTCTCCCTTCGGGAAGCGTGGCGCTTTCTCATAGCTCACGCTGTAGGTATCTC
AGTTCGGTGTAGGTCGTTTCGCTCCAAGCTGGGCTGTGTGCACGAACCCCCCGTTCAGCCCGACCG

CTGCGCCTTATCCGGTAACTATCGTCTTGAGTCCAACCCGGTAAGACACGACTTATCGCCACTGGC
AGCAGCCACTGGTAACAGGATTAGCAGAGCGAGGTATGTAGGCGGTGCTACAGAGTTCTTGAAGT
GGTGGCCTAACTACGGCTACACTAGAAGAACAGTATTTGGTATCTGCGCTCTGCTGAAGCCAGTTA
CCTTCGGAAAAAGAGTTGGTAGCTCTTGATCCGGCAAACAAACCACCGCTGGTAGCGGTGGTTTT
TTTGTGGCAAGCAGCAGATTACGCGCAGAAAAAAGGATCTCAAGAAGATCCTTTGATCTTTTCT
ACGGGGTCTGACGCTCAGTGGAAACGAAAACCTCACGTAAAGGGATTTTGGTCATGAGATTATCAA
AAGGATCTTACCTAGATCCTTTTAAATTAATAAATGAAGTTTTAAATCAATCTAAAGTATATATGAG
TAAACTTGGTCTGACAGTTACCAATGCTTAATCAGTGAGGCACCTATCTCAGCGATCTGTCTATTT
GTTTCATCCATAGTTGCCTGACTCCCCGTCGTGTAGATAACTACGATACGGGAGGGCTTACCATCTG
GCCCCAGTGCTGCAATGATACCGCGAGACCCACGCTCACCGGCTCCAGATTTATCAGCAATAAAC
CAGCCAGCCGGAAGGGCCGAGCGCAGAAGTGGTCCTGCAACTTTATCCGCCTCCATCCAGTCTAT
TAATTGTTGCCGGAAGCTAGAGTAAGTAGTTCGCCAGTTAATAGTTTGCGCAACGTTGTTGCCAT
TGCTACAGGCATCGTGGTGTACGCTCGTCTTGGTATGGCTTCATTAGCTCCGTTCCCAACG
ATCAAGGCGAGTTACATGATCCCCATGTTGTGCAAAAAAGCGGTTAGCTCCTTCGGTCTCCGAT
CGTTGTCAGAAGTAAGTTGGCCGAGTGTATCACTCATGGTTATGGCAGCACTGCATAATTCTCTT
ACTGTCATGCCATCCGTAAGATGCTTTTCTGTGACTGGTACTCAACCAAGTCATTCTGAGAA
TAGTGTATGCGGCGACCGAGTTGCTCTTGGCCGCGTCAATACGGGATAATACCGCGCCACATAGC
AGAACTTTAAAAGTGCTCATCATTGGAAAACGTTCTTCGGGGCGAAAACCTCTCAAGGATCTTACC
GCTGTTGAGATCCAGTTCGATGTAACCCACTCGTGCACCCAACTGATCTTCAGCATCTTTACTTT
ACCAGCGTTTCTGGGTGAGCAAAAAACAGGAAGGCAAAATGCCGCAAAAAAGGGAATAAGGGCG
ACACGGAAATGTTGAATACTCATACTTCTCTTTTCAATATTATTGAAGCATTATCAGGGTTATTG
TCTCATGAGCGGATACATATTTGAATGTATTTAGAAAAATAAACAAATAGGGGTTCCGCGCACATT
TCCCCGAAAAGTGCCAC

Sequence S04. Sequence of the 4612 PB plasmid pBSK-HASA1. The sequence of the coding Sequence of *hasA1* gene is highlighted in yellow.

CTGACGCGCCCTGTAGCGGCGCATTAAAGCGCGGCGGGTGTGGTGGTTACGCGCAGCGTGACCGCT
ACACTTGCCAGCGCCCTAGCGCCCGCTCCTTTGCTTTTCTTCCCTTCCCTTCTCGCCACGTTCCGCC
GCTTTCCCGTCAAGCTCTAAATCGGGGGCTCCCTTTAGGGTTCCGATTTAGTGCTTTACGGCACCT
CGACCCCAAAAACTTGATTAGGGTGATGGTTCACGTAGTGGGCCATCGCCCTGATAGACGGTTTT
TCGCCCTTTGACGTTGGAGTCCACGTTCTTTAATAGTGGACTCTTGTTCCAAACCTGGAACAACACT
CAACCCTATCTCGGTCTATTCTTTTATTATAAGGGATTTTGGCGATTTCCGGCCTATTGGTTAAAAA
ATGAGCTGATTTAACAAAAATTTAACGCGAATTTTAAACAAAATATTAACGCTTACAATTTGCCATTC
GCCATTCAGGCTGCGCAACTGTTGGGAAGGGCGATCGGTGCGGGCCTCTTCGCTATTACGCCAGC
TGCGGAAAGGGGGATGTGCTGCAAGGCGATTAAGTTGGGTAACGCCAGGGTTTTCCAGTCACGA
CGTTGTAAAACGACGGCCAGTGAATTGTAATACGACTACTATAGGGCGACCCTTTAAGCTTATGAA
GGCAACAAGATGCTCCTAAGCCTACTCCTGCAGCTTGCAGATGTAGTGGATTAGCCAGAAGGGTT
TTAACTATCGCATTGCTTTGTTAATATTGGGTTAATGACCTGGGCATATGCCGCCGGTGTGCCTTT
GGCAAGTGATAGATATGGATTGTTGGCCTTCGGTTTATATGGAGCCTTCTTGTGAGCTCACTTGGTT
GCTCAGTCATTGTTGCTTACTTGGAAACACAGGAGAGTTGCTGCTGCAGCTAGAGGTCCATTGGAT
GCAGCTACAGCTCGTTCAGTGGCTTACTATCTCTGCTTATCAGGAAGACCCAGCCTACTTGAGA
CAATGCTTAGCATCTGCAAGAGCATTGTTGTATCCACGTGCAAGGTTACGTGTGTTGATGGTTGTA

GATGGTAATAGAGCCGAAGATTGTACATGGTAGATATGTTCCGTGAAGTGTTCAGATGAAGAT
CCAGCCACATACGTCTGGGACGGTAACTATCATCAACCTTGGGAACCAGCTGCAGCAGGAGCAGT
AGGTGCAGGAGCATATAGGGAGGTGGAAGCAGAGGATCCAGGTAGATTAGCTGTTGAAGCATT
GTAAGAACAAGGAGATGTGTATGCGTGGCCCAAAGGTGGGGTGGTAAGAGGGAGGTAATGTACA
CTGCCTTTAAAGCCTTAGGAGATTGAGTTGACTATGTGCAGGTATGCGATTGAGACACCAGATTGG
ACCCATGGCATTGTTGGAGTTAGTAAGAGTATTGGATGAGGATCCTAGAGTTGGTGCAGTGGGTG
GTGATGTGCGTATCTTGAACCCTTTGGATTCATGGGTCTCTTTCTTGTCTTCATTGAGATACTGGGTG
GCCTTTAATGTAGAACGTGCATGCCAGTCATACTTCCATTGTGTCTCATGCATCTCTGGACCTTTGG
GTTTATACAGAAACAACCTTATTGCAACAGTTCTTAGAGGCATGGTACAACCAAAAAGTTCTTAGGA
ACCCATTGCACCTTCGGAGATGACAGACACTTACTAACAGAATGTTATCTATGGGTATGCTACT
AAGTATACTAGTAGATCAAGGTGCTACTCAGAACTCCTAGTTTATTCTTGGAGATGGTTATCACA
CAGACCAGGTGGTCAAAGAGTTACTTTAGAGAATGGTTGTACAATGCCTTGTGGTGGCACAGGCA
TCATGCTTGGATGACATACGAAGCAGTCGTTAGTGGATTGTTCCCTTTCTTGTGCGCAGCTACTGTA
TTACGTTTATTCTATGCAGGTAGACCATGGGCTTTATTGTGGGTATTATTATGTGTTCAAGGTGTAGC
TTAGCAAAGGCCGCTTTTGCAGCATGGTTGAGAGGTTGCTTGAAGAATGGTTTTATTGTCATTGTAC
GCTCCATTATACATGTGTGGATTGTTGCCAGCTAAGTTCTTAGCATTGGTAACAATGAATCAATCAG
GTTGGGGTACTTCAGGAAGAAGAAAATTAGCTGCTAATTACGTTCCCTTTGTTGCCATTGGCTTTATG
GGCATTGTTGTTATTGGGTGGATTAGTAAGATCTGTAGCACATGAAGCCAGAGCAGATTGGTCAGG
TCCAAGTAGAGCAGCCGAGGCTTATCATTGGCTGCAGGTGCAGGAGCCTACGTAGGTTACTGGG
TGGCTATGTTAACATTATACTGGGTTGGTGTAGAAGATTGTGTAGAAGAAGAAGTGGAGGTTACA
GAGTTCAAGTGTAAGGCCTAAAGGGGATATCCTCGAGGTTCCCTTTAGTGAGGGTTAATTGCGA
GCTTGGCGTAATCATGGTCATAGCTGTTTCTGTGTGAAATTGTTATCCGCTACAATTCCACACAA
CATACGAGCCGGAAGCATAAAGTGTAAGCCTGGGGTGCCTAATGAGTGAGCTAACTCACATTAA
TTGCGTTGCGCTCACTGCCGCTTTCCAGTCGGGAAACCTGTCGTGCCAGCTGCATTAATGAATCG
GCCAACGCGCGGGGAGAGGCGGTTTGCATTTGGGCGCTCTTCCGCTTCCCTCGCTCACTGACTCG
CTGCGCTCGGTCGTTCCGCTGCGGCGAGCGGTATCAGCTCACTCAAAGGCGGTAATACGGTTATCC
ACAGAATCAGGGGATAACGCAGGAAAGAACATGTGAGCAAAAGGCCAGCAAAAGGCCAGGAA
CCGTA AAAAGGCCGCTTGGCTGGCGTTTTTCCATAGGCTCCGCCCCCTGACGAGCATCACAAAA
ATCGACGCTCAAGTCAGAGGTGGCGAAACCCGACAGGACTATAAAGATAACCAGGCGTTCCCCCT
GGAAGCTCCCTCGTGCCTCTCTGTTCCGACCCTGCCGTTACCGGATACTGTCCGCTTTCTCC
CTTCGGGAAGCGTGGCGCTTTCTCATAGCTCACGCTGTAGGTATCTCAGTTCGGTGTAGGTCGTT
GCTCCAAGCTGGGCTGTGTGCACGAACCCCCGTTACCCGACCGCTGCGCCTTATCCGTAAC
TATCGTCTTGAATCAACCCGTAAGACACGACTTATCGCCACTGGCAGCAGCCACTGGTAACAG
GATTAGCAGAGCGAGGTATGTAGGCGGTGCTACAGAGTTCTTGAAGTGGTGGCCTAACTACGGCT
ACACTAGAAGAACAGTATTTGGTATCTGCGCTCTGCTGAAGCCAGTTACCTTCGGAAAAAGAGTT
GGTAGCTCTTGAATCCGCAACAAACCACCGCTGGTAGCGGTGGTTTTTTTGTGTTGCAAGCAGCA
GATTACGCGCAGAAAAAAGGATCTCAAGAAGATCCTTTGATCTTTTCTACGGGGTCTGACGCTC
AGTGGAACGAAAACCTCACGTTAAGGGATTTTGGTCATGAGATTATCAAAAAGGATCTTACCTAG
ATCCTTTTAAATTA AAAATGAAGTTTTAAATCAATCTAAAGTATATATGAGTAAACTTGGTCTGACA
GTTACCAATGCTTAATCAGTGAGGCACCTATCTCAGCGATCTGTCTATTTGTTTTCATCCATAGTTGC
CTGACTCCCCGTCGTGTAGATAACTACGATACGGGAGGGCTTACCATCTGGCCCCAGTGCTGCAAT
GATAACGCGAGACCCACGCTCACCGGCTCCAGATTTATCAGCAATAAACCAGCCAGCCGGAAGG
GCCGAGCGCAGAAGTGGTCCTGCAACTTTATCCGCTCCATCCAGTCTATTAATTGTTGCCGGGAA
GCTAGAGTAAGTAGTTCGCCAGTTAATAGTTTGCGCAACGTTGTTGCCATTGCTACAGGCATCGTG

GTGTCACGCTCGTCGTTTTGGTATGGCTTCATTCAGCTCCGGTCCCAACGATCAAGGCGAGTTACA
TGATCCCCCATGTTGTGCAAAAAAGCGGTTAGCTCCTTCGGTCTCCGATCGTTGTCAGAAGTAAG
TTGGCCGAGTGTATCACTCATGGTTATGGCAGCACTGCATAATTCTCTTACTGTCATGCCATCCG
TAAGATGCTTTTTCTGTGACTGGTGAGTACTCAACCAAGTCATTCTGAGAATAGTGTATGCGGCGAC
CGAGTTGCTCTTGCCCGGCGTCAATACGGGATAATACCGCGCCACATAGCAGAACTTTAAAAGTG
CTCATCATTGGAAAACGTTCTTCGGGGCGAAAACCTCTCAAGGATCTTACCGCTGTTGAGATCCAGT
TCGATGTAACCCACTCGTGCACCCAACCTGATCTTCAGCATCTTTTACTTTACCAGCGTTTCTGGGT
GAGCAAAAACAGGAAGGCAAAATGCCGCAAAAAAGGGAATAAGGGCGACACGGAAATGTTGA
ATACTCATACTCTTCTTTTTCAATATTATTGAAGCATTATCAGGGTTATTGTCTCATGAGCGGATA
CATATTTGAATGTATTTAGAAAAATAAACAAATAGGGGTTCCGCGCACATTTCCCCGAAAAGTGCC
AC

Sequence S05. Sequence of the 4540 PB plasmid pBSK-HASA2. The sequence of the coding Sequence of *hasA2* gene is highlighted in yellow.

CTGACGCGCCCTGTAGCGGCGCATTAAAGCGCGGCGGGTGTGGTGGTTACGCGCAGCGTGACCGCT
ACACTTGCCAGCGCCCTAGCGCCCGCTCCTTTCGCTTCTTCCCTTCCTTCTCGCCACGTTCCCG
GCTTTCCCGTCAAGCTCTAAATCGGGGGCTCCCTTATAGGGTCCGATTTAGTGTTCACGGCACCT
CGACCCCAAAAACTTGATTAGGGTGATGGTTCACGTAGTGGGCCATCGCCCTGATAGACGGTTTT
TCGCCCTTGTACGTTGGAGTCCACGTTCTTTAATAGTGGACTCTTGTTCCAAACCTGGAACAACACT
CAACCCTATCTCGGTCTATTCTTTTATTATAAGGGATTTTGGCGATTTCCGGCCTATTGGTTAAAAA
ATGAGCTGATTTAACAAAAATTTAACCGGAATTTAACAAAATATTAACGCTTACAATTTGCCATTC
GCCATTCAGGCTGCGCAACTGTTGGGAAGGGCGATCGGTGCGGGCCTCTTCGCTATTACGCCAGC
TGCGGAAAGGGGGATGTGCTGCAAGGCGATTAAGTTGGGTAACGCCAGGGTTTTCCAGTCACGA
CGTTGTA AACGACGGCCAGTGAATTGTAATACGACTCACTATAGGGCGACCCTTAAAACCTCGAG
ATGCACTGTGAAAGATTCTTGTGTATCTTGAGGATCATAGGTAACCTTATTTCGGTGTGTCATTGTT
GTTAGGTATTACAGCAGCTTACATAGTAGGTTATCAGTTCATACAGACTGACAATTACTACTTTAGT
TTTGGATTGTACGGAGCATTCTTGGCTTCTCATTGATTATCCAGAGTTTGTTCGCCTTCTTAGAACA
TAGAAAGATGAAGAAATCATTAGAACTCCAATCAAGTTGAATAAGACTGTTGCCTTGTGTATTGC
CGCATACCAAGAAGATCCAGACTACTTGAGAAAGTGCTTGCAATCAGTCAAGAGGTTAACCTATC
CAGGTATCAAAGTTGTGATGGTATTGACGGAAATCTGAAGATGATTTGTATATGATGGACATCTT
TAGTGAAGTCATGGGTAGAGATAAGTCTGCAACTTACATATGGAAGAATAACTTTCACGAAAAGG
GTCCAGGTGAAACTGATGAATCTCACAAAGAATCATCTCAACATGTAACCTCAATGGTCTTATCAA
ACAAATCAATTTGCATCATGCAGAAATGGGGTGGTAAGAGAGAAGTTATGTACACTGCTTTCAGA
GCATTAGGTCGTTCTGTTGATTATGTACAAGTCTGTGACAGTGATACAATGTTGGACCCAGCAAGT
TCAGTTGAGATGGTGAAGTTTTAGAAGAAGATCCAATGGTGGGTGGTGTCCGGTGGTGACGTTCA
GATTTTGAATAAGTACGACTCTTGGATCTCATTCTTGTGTCATCAGTAAGATACTGGATGGCCTTCAAC
ATTGAAAGAGCTTGTCAATCTTACTTCGGATGCGTGCAGTGTATTTCTGGTCCATTGGGTATGTATA
GAAATTCATTGTTACATGAGTTCGTGGAGGATTGGTACAATCAAGAGTTCATGGGTAACCAATGTT
CTTTCGGTGATGATAGACATTTGACAAATAGGGTTTTGTCTTTAGGTTATGCAACCAAGTACACCGC
TAGGTCAAAGTGTTAACTGAAACTCCAATAGAATACTTGAGATGGTTGAATCAACAAACCAGAT
GGAGTAAGTCTTACTTCAGAGAATGGTTGTACAATGCTATGTGGTTTCAACAGCATCATTGTGGAT
GACTTATGAGGCCATTATCACTGGTTTCTTCCATTCTTCTTGATTGCAACTGTTATCCAGTTGTTCT

ACCGTGGTAAGATATGGAATATCTTGTATTCTTATTGACTGTCCAATTGGTAGGATTGATAAAGTC
ATCATTGCTTCTTGTGGAGGGGTAACATTGTTATGGTGTTCATGTCTTTGTACAGTGTGGTGTATAT
GTCAAGTTTGTGGCCAGCTAAGATGTTCCGCAATGCTACAATCAACAAAGCTGGTTGGGGAACATC
TGGAAGAAAGACTATTGTTGTGAACTTCATTGGATTGATACCTGTGAGTGTGTGGTTTACCATCTTA
TTGGGTGGAGTTATCTTCACAATCTACAAGGAATCAAAGAGACCTTTCAGTGAATCTAAACAGAC
CGTGTGATAGTAGGAACCTTGTGTACGCTTGTATTGGGTAATGTTGTTAACCTTGTACGTGGTCT
TGATCAATAAGTGTGGTAGACGTAAGAAGGGTCAACAATATGATATGGTCTTGGATGTTTGAGAAT
TCAAATTAGGGGATATCCTCGAGGTTCCCTTTAGTGAGGGTAAATTGCGAGCTTGGCGTAATCATG
GTCATAGCTGTTTCCGTGTGTGAAATTGTTATCCGCTCACAAATCCACACAACATACGAGCCGGAAG
CATAAAGTGTAAGCCTGGGGTGCCTAATGAGTGAGCTAACTCACATTAATTGCGTTGCGCTCACT
GCCCCCTTCCAGTCGGGAAACCTGTCGTGCCAGCTGCATTAATGAATCGGCCAACGCGCGGGGA
GAGGCGGTTTGGCTATTGGGCGCTCTTCCGCTTCCCTCGCTCACTGACTCGCTGCGCTCGGTCGTT
GGCTGCGGGAGCGGTATCAGCTCACTCAAAGGCGGTAATACGGTTATCCACAGAATCAGGGGAT
AACGCAGGAAAGAACATGTGAGCAAAAGGCCAGCAAAAGGCCAGGAACCGTAAAAAGGCCGC
GTTGCTGGCGTTTTTCCATAGGCTCCGCCCCCTGACGAGCATCACAAAATCGACGCTCAAGTC
AGAGGTGGCGAAACCCGACAGGACTATAAAGATACCAGGCGTTTTCCCCCTGGAAGCTCCCTCGT
GCGCTCTCCTGTTCCGACCCGCGCTTACCGGATACCTGTCCGCTTTCTCCCTTCGGGAAGCGT
GGCGCTTCTCATAGCTCACGCTGTAGGTATCTCAGTTCGGTGTAGGTCGTTCCGCTCCAAGCTGGG
CTGTGTGCACGAACCCCGTTCAGCCCGACCGCTGCGCCTTATCCGGTAACTATCGTCTTGAGTC
CAACCCGGTAAGACACGACTTATCGCCACTGGCAGCAGCCACTGGTAAACAGGATTAGCAGAGCG
AGGTATGTAGGCGGTGCTACAGAGTCTTGAAGTGGTGGCCTAACTACGGCTACACTAGAAGAAC
AGTATTTGGTATCTGCGCTCTGCTGAAGCCAGTTACCTTCGGAAAAAGAGTTGGTAGCTCTTGATC
CGGCAACAAACCACCGCTGGTAGCGGTGGTTTTTTTTGTTTGCAAGCAGCAGATTACGCGCAGAA
AAAAAGGATCTCAAGAAGATCCTTTGATCTTTTCTACGGGGTCTGACGCTCAGTGAACGAAAAC
TCACGTTAAGGATTTTGGTCATGAGATTATCAAAAAGGATCTTACCTAGATCCTTTTAAATTA
AATGAAGTTTTAAATCAATCTAAAGTATATGAGTAAACTTGGTCTGACAGTTACCAATGCTTAAT
CAGTGAGGCACCTATCTCAGCGATCTGTCTATTTGTTTCATCCATAGTTGCCTGACTCCCCGTCGTG
TAGATAACTACGATACGGGAGGGCTTACCATCTGGCCCCAGTGCTGCAATGATACCGCGAGACCC
ACGCTCACCGGCTCCAGATTTATCAGCAATAAACCAGCCAGCCGGAAGGGCCGAGCGCAGAAGT
GGTCTGCAACTTTATCCGCTCCATCCAGTCTATTAATTGTTGCCGGAAGCTAGAGTAAGTAGTT
CGCCAGTTAATAGTTTGGCAACGTTGTTGCCATTGCTACAGGCATCGTGGTGTACGCTCGTCGT
TTGGTATGGCTTCATTCAGCTCCGGTTCCCAACGATCAAGGCGAGTTACATGATCCCCCATGTTGTG
CAAAAAGCGGTTAGCTCCTTCGGTCTCCGATCGTTGTCAGAAGTAAGTTGGCCGCAGTGTTATC
ACTCATGGTTATGGCAGCACTGCATAATTCTTACTGTGATGCCATCCGTAAGATGCTTTTCTGTG
ACTGGTGAAGTCAACCAAGTCATTCTGAGAATAGTGTATGCGGGCACCAGTTGCTCTTGGCCG
GCGTCAATACGGGATAATACCGCGCCACATAGCAGAACTTTAAAAGTGCTCATCATTGGAAAACG
TTCTTCGGGGCGAAAACCTCTCAAGGATCTTACCGCTGTTGAGATCCAGTTCGATGTAACCCACTCG
TGCACCAACTGATCTTACGATCTTTACTTTACCAGCGTTTCTGGGTGAGCAAAAACAGGAAG
GCAAAATGCCGCAAAAAGGGGAATAAGGGCGACACGGAAATGTTGAATACTCATACTCTTCCTT
TTCAATATTATTGAAGCATTATCAGGGTTATTGTCTCATGAGCGGATACATATTTGAATGTATTTAG
AAAAATAAACAAATAGGGGTTCCGCGCACATTTCCCCGAAAAGTGCCAC

Sequence S06. Sequence of the 4540 PB plasmid pBSK-HASA3. The sequence of the coding Sequence of *hasA3* gene is highlighted in yellow.

CTGACGCGCCCTGTAGCGGCGCATTAAAGCGCGGGCGGGTGTGGTGGTTACGCGCAGCGTGACCGCT
ACACTTGCCAGCGCCCTAGCGCCCCTCCTTTTCGCTTTCTTCCCTTCCCTTCTCGCCACGTTCCGCC
GCTTTCCCGTCAAGCTCTAAATCGGGGGCTCCCTTTAGGGTTCCGATTTAGTGCTTTACGGCACCT
CGACCCCAAAAACTTGATTAGGGTGATGGTTCACGTAGTGGGCCATCGCCCTGATAGACGGTTTT
TCGCCCTTTGACGTTGGAGTCCACGTTCTTTAATAGTGGACTCTTGTTCAAAACCTGGAACAACACT
CAACCCTATCTCGGTCTATTCTTTTATTATAAGGGATTTTGGCGATTTCCGGCCTATTGGTTAAAAA
ATGAGCTGATTTAACAAAAATTTAACGCGAATTTTAAACAAAATATTAACGCTTACAATTTGCCATTC
GCCATTCAGGCTGCGCAACTGTTGGGAAGGGCGATCGGTGCGGGCCTCTTCGCTATTACGCCAGC
TGGCGAAAGGGGGATGTGCTGCAAGGCGATTAAGTTGGGTAACGCCAGGGTTTTCCAGTCACGA
CGTTGTA AACGACGCGCCAGTGAATTGTAATACGACTCACTATAGGGCGACCCAAAACCTCGAGAT
GCCAGTACAGTTGACTACAGCCTTGAGGGTTGTCGGAACATCATTGTTTCGCTTTGGCTGTTTTAGG
TGGTATCTTGGCTGCTTATGTCACTGGTATCAATTCATTACTGAAAAGCATTACTTAAGTTTCG
GATTGTATGGAGCTATCTTAGGTTTGCCTTGTGATACAAAGTTTGTTCGCTTTCTTGGAGCATAG
AAGAATGCGTCGTGCTGGTCAGGCTTTGAAATTGCCTAGTCTCGTAGAGGTAGTGTGCTTTGTG
TATTGCAGCTTATCAGGAGGACCCTGATTACTTGAGAAAATGTTAAGATCTGCTCAGAGAATTTTC
ATTCCCTGATTTGAAGGTTGTTATGGTAGTGGATGGAAATCGTCAAGAAGACGCATACATGTTAGA
TATCTTTCATGAAGTATTGGGTGGTACTGAGCAGGCAGGTTTCTTCGTTTGGAGGTCAAACCTCCA
CGAAGCTGGTGAAGGAGAGACCGAAGCCTCATTGCAAGAAGGTATGGATAGAGTCAGGGACGTG
GTCAGAGCATCTACCTTCAGTTGCATTATGCAAAAAGTGGGGTGGTAAGAGGGGAGGTGATGTACAC
TGCATTCAAGGCTTTAGGTGATTGAGTGGACTATAATCCAAGTGTGTGACTCAGATACAGTTTTAGAT
CCAGCCTGCACTATCGAGATGTTGAGAGTTTTGGAAGAAGATCCACAGGTCGGAGGTGTGGGTGG
AGATGTGCAGATATTGAACAAATACGATAGTTGGATCTCTTCTTGTCTAGTGTAAAGATACTGGATG
GCTTTCAACGTCGAAAGAGCTTGTCAATCTTACTTTGGTTGCGTTCAATGTATTTCTGGTCCCTTGG
GAATGTACAGAAATTCTTTGTTGCAACAGTTCTTGGAGGACTGGTACCATCAGAAATTCTTAGGAT
CTAAGTGTAGTTTTGGAGATGATAGACATTTGACTAATAGAGTGTGAGTTTAGGTTACAGAACCA
AGTACACCGCTAGATCAAAGTGCTTACTGAAACTCCAACCAAAATACTGAGATGGTTGAATCAA
CAAACAAGGTGGTCAAAGAGTACTTCAGAGAATGGTTGTATAACTCTTTATGGTTTCACAAGCAT
CACTTATGGATGACTTATGAATCTGTTGTCAACCGGTTTCTTCCATTCTTCTTAATCGCTACAGTGAT
TCAGTTGTTTTACAGAGGTAGAATTTGGAATATTTTATTGTTCTTGTGACTGTCCAATTAGTAGGTA
TCATCAAAGCTACTTACGCTTGTCTTACGTGGTAACGCCGAAATGATCTTCATGTCATTGTATAGT
TTGTTATACATGTCATCATTGTTGCCAGCCAAGATTTTCGCTATCGCCACCATCAATAAGTCAGGTT
GGGTACTAGTGGAAAGGAAAACAATTGTTGTCAACTTCATTGGATTGATACCAGTGAGTATTTGGG
TAGCAGTATTGTTAGGTGGTTTGGCCTATACTGCTTATTGTCAAGACTTGTCTCAGAAACTGAATT
AGCATTCTGGTTTCTGGTGCAATCTTATACGGTTGCTATTGGGTTGCTTTGTTAATGTTATACTTGGC
AATCATTGCTAGAAGATGCGGAAAGAAACCAGAACAGTACTCTTAGCATTGCGCAAGTTTAAAG
AATTCAAATTGGGGATATCCTCGAGGTTCCCTTTAGTGAGGGTTAATTGCGAGCTTGGCGTAATCAT
GGTCATAGCTGTTTCCGTGTGAAATTGTATCCGCTCACAATTCCACACAACATAACGAGCCGGAA
GCATAAAGTGTAAGCCTGGGGTGCCTAATGAGTGAGCTAACTCACATTAATTGCGTTGCGCTCAC
TGCCCGCTTTCCAGTCGGGAAACCTGTGCGTCCAGCTGCATTAATGAATCGGCCAACGCGCGGGG
AGAGGCGGTTTTCGCTATTGGGCGCTCTTCCGCTTCCCTCGCTCACTGACTCGCTGCGCTCGGTTCGTT
CGGCTGCGGCGAGCGGTATCAGCTCACTCAAAGGCGGTAATACGGTTATCCACAGAATCAGGGGA
TAACGCAGGAAAGAACATGTGAGCAAAGGCCAGCAAAGGCCAGGAACCGTAAAAAGGCCG

CGTTGCTGGCGTTTTTCCATAGGCTCCGCCCCCTGACGAGCATCACAAAAATCGACGCTCAAGTC
AGAGGTGGCGAAACCCGACAGGACTATAAAGATAACCAGGCGTTTTCCCCTGGAAGCTCCCTCGT
GCGCTCTCCTGTTCCGACCCCTGCCGCTTACCGGATACCTGTCCGCTTTCTCCCTTCGGGAAGCGT
GGCGCTTCTCATAGCTCACGCTGTAGGTATCTCAGTTCGGTGTAGGTCGTTTCGCTCCAAGCTGGG
CTGTGTGCACGAACCCCCCGTTCAGCCCCGACCGCTGCGCCTTATCCGGTAACTATCGTCTTGAGTC
CAACCCGGTAAGACACGACTTATCGCCACTGGCAGCAGCCACTGGTAACAGGATTAGCAGAGCG
AGGTATGTAGGCGGTGCTACAGAGTTCCTGAAGTGGTGGCCTAACTACGGCTACACTAGAAGAAC
AGTATTTGGTATCTGCGCTCTGCTGAAGCCAGTTACCTTCGGAAAAAGAGTTGGTAGCTCTTGATC
CGGCAAAACAAACCACCGCTGGTAGCGGTGGTTTTTTTTGTTTGCAAGCAGCAGATTACGCGCAGAA
AAAAAGGATCTCAAGAAGATCCTTTGATCTTTTCTACGGGGTCTGACGCTCAGTGAACGAAAAC
TCACGTTAAGGGATTTTGGTCATGAGATTATCAAAAAGGATCTTCACCTAGATCCTTTTAAATTA
AATGAAGTTTTAAATCAATCTAAAGTATATATGAGTAAACTTGGTCTGACAGTTACCAATGCTTAAT
CAGTGAGGCACCTATCTCAGCGATCTGTCTATTTTCGTTTCATCCATAGTTGCCTGACTCCCCGTCGTG
TAGATAACTACGATACGGGAGGGCTTACCATCTGGCCCCAGTGCTGCAATGATACCGCGAGACCC
ACGCTCACCGGCTCCAGATTTATCAGCAATAAACCAGCCAGCCGGAAGGGCCGAGCGCAGAAGT
GGTCTGCAACTTTATCCGCCTCCATCCAGTCTATTAATTGTTGCCGGAAGCTAGAGTAAGTAGTT
CGCCAGTTAATAGTTTGCACAACGTTGTTGCCATTGCTACAGGCATCGTGGTGTACGCTCGTCGT
TTGGTATGGCTTCATTCAGCTCCGGTCCCAACGATCAAGGCGAGTTACATGATCCCCATGTTGTG
CAAAAAGCGGTTAGCTCCTTCGGTCTCCGATCGTTGTCAGAAGTAAGTTGGCCGCAGTGTTATC
ACTCATGGTTATGGCAGCACTGCATAATTCTCTTACTGTGTCATGCCATCCGTAAGATGCTTTTCTGTG
ACTGGTGAGTACTCAACCAAGTCATTCTGAGAATAGTGTATGCGGCGACCGAGTTGCTCTTGCCCC
GCGTCAATACGGGATAATACCGCGCCACATAGCAGAACTTTAAAAGTGCTCATCATTGGAAAACG
TTCTTCGGGGCGAAAACCTCTCAAGGATCTTACCGCTGTTGAGATCCAGTTCGATGTAACCCACTCG
TGCACCAACTGATCTTCAGCATCTTTTACTTTACCAGCGTTTCTGGGTGAGCAAAAACAGGAAG
GCAAAATGCCGCAAAAAAGGGAATAAGGGCGACACGGAAATGTTGAATACTCATACTCTTCCTTT
TTCAATATTATTGAAGCATTATCAGGGTTATTGTCTCATGAGCGGATACATATTTGAATGTATTTAG
AAAAATAAACAAATAGGGGTTCCGCGCACATTTCCCCGAAAAGTGCCAC

Sequence S07. Sequence of the 11547 PB plasmid pkLAC2-B. The sequence of GPD Promoter and CYC1 terminator is highlighted in yellow and the coding Sequence of *hasB* gene is highlighted in gray.

AAGCTTGAAAAAATGAAATTCTACTATATTAGCCGCATCTACTGCTTTAATTTCCGTTGTTATG
GCTGCTCCAGTTTCTACCGAAACTGACATCGACGATCTCCAATATCGGTTCCAGAAGAAGCCTTG
ATTGGATTCATTGACTTAACCGGGGATGAAGTTTCCTTGTTGCCTGTTAATAACGGAACCCACACT
GGTATTCTATTCTTAAACACCACCATCGCTGAAGCTGCTTTTCGCTGACAAGGATGATCTCGAGAAA
AGAGAGGCTGAAGCTAGAAGAGCTCATATGTCCATGGGCGGCCGCGATATCGTCGACGGATCCGA
ATTCCCTGCAGGTAATTAATAAAGGCCTTGAATCGAGAATTTATACTTAGATAAGTATGTACTTAC
AGGTATATTTCTATGAGATACTGATGTATACATGCATGATAATTTAAACGGTTATTAGTGCCGATT
GTCTTGTGCGATAATGACGTTCCCTATCAAAGCAATACACTTACCACCTATTACATGGGCCAAGAAA
ATATTTTCGAACCTTGTTTGAATATTAGCACAGAGTATATGATGTTATCCGTTAGATTATGCATGATT
CATTCTACAACCTTTTCGTAGCATAAGGATTAATTACTTGGATGCCAATAAAAAAAAAAACATC
GAGAAAATTCAGCATGCTCAGAAACAATTGCAGTGTATCAAAGTAAAAAAGATTTTCACTAC
ATGTTCCCTTTTGAAGAAAGAAAATCATGGAACATTAGATTTACAAAAATTTAACCACCGCTGATTA

ACGATTAGACCGTTAAGCGCACAAACAGGTTATTAGTACAGAGAAAGCATTCTGTGGTGTGCCCC
GGACTTTCTTTTGGCACATAGGTAATCGAATACCATCATACTATCTTTTCCAATGACTCCCTAAAG
AAAGACTCTTCTTCGATGTTGTATACGTTGGAGCATAGGGCAAGAATTGTGGCTTGAGATCATCT
TTTGTGTTTCCGGGTGTACAATATGGACTTCCTCTTTTCTGGCAACCAAACCCATACATCGGGATT
CCTATAATACCTTCGTTGGTCTCCCTAACATGTAGGTGGCGGAGGGGAGATATAACAATAGAACAGA
TACCAGACAAGACATAATGGGCTAAACAAGACTACACCAATTACACTGCCTCATTGATGGTGGTA
CATAACGAACTAATACTGTAGCCCTAGACTTGATAGCCATCATCATATCGAAGTTTCACTACCCTTT
TTCCATTTGCCATCTATTGAAGTAATAATAGGCGCATGCAACTTCTTTTCTTTTTTTTTCTTTCTCTC
TCCCCCGTTGTTGTCTCACCATATCCGCAATGACAAAAAATGATGGAAGACACTAAAGGAAAA
ATTAACGACAAAGACAGCACCAACAGATGTCGTTGTTCCAGAGCTGATGAGGGGTATCTCGAAGC
ACACGAACTTTTTCTTCTTCAATCACGCACACTACTCTAATGAGCAACGGTATACGGCCTTC
CTTCCAGTTACTTGAATTTGAAATAAAAAAAGTTTGCTGTCTTGTATCAAGTATAAATAGACCTG
CAATTATTAATCTTTTGTTCCTCGTCATTGTTCTCGTTCCCTTTCTTCTTCTTTTCTGACAA
TATTTCAAGCTATAACCAAGCATAACAATCAAGCAATTCCAGATCTGCCACCATGCCTCAATCCTGGG
AAGA ACTGGCCGCTGATAAGCGCGCCCGCTCGCAAAAACCATCCCTGATGAATGGAAAGTCCA
GACGCTGCCTGCGGAAGACAGCGTTATTGATTTCCCAAAGAAATCGGGCATCTTTCAGAGGCCG
AACTGAAGATCACAGAGGCTTCCGCTGCGGATCTTGTGTCCAAGCTGGCGGCCGGAGAGTTGACC
TCGGTGGAAGTTACGCTAGCATTCTGTAAACGGGCAGCAATCGCCAGCAGTTAACAAACTGCGC
CCACGAGTTCTTCCCTGACGCCGCTCTCGCGCAGGCAAGGGA ACTCGATGAATACTACGCAAAGC
ACAAGAGACCCGTTGGTCCACTTCATGGCCTCCCCATCTCTCAAAGACCAGCTTCGAGTCAAG
GGCTACGAAACATCAATGGGCTACATCTCATGGCTAAACAAGTACGACGAAGGGGACTCGGTTCT
GACAACCATGCTCCGCAAAGCCGGTGCCGCTTCTACGTCAAGACCTCTGTCCCGCAGACCCTGA
TGGTCTGCGAGACAGTCAACAACATCATCGGGCGCACCGTCAACCCACGCAACAAGAACTGGTC
GTGCGGCCGACAGTTCTGGTGGTGAGGGTGGCATCGTTGGGATTCTGTGGTGGCGTCATCGGTGTAG
GAACGGACATCGGTGGCTCGATTTCGAGTGCCGGCCGCGTTCAACTTCTGTACGGTCTAAGGCCG
AGTCATGGGCGGCTGCCGTATGCAAAGATGGCGAACAGCATGGAGGGTCAAGGAGACGGTGCACA
GCGTTGTGCGGCCGATTACGCACTCTGTTGAGGACCTCCGCCTTTCACCAAATCCGTCCTCGGTC
AGGAGCCTTGAAATACGACTCCAAGGTCATCCCCATGCCCTGGCGCCAGTCCGAGTCCGACATT
ATTGCCTCCAAGATCAAGAACGGCGGGCTCAATATCGGCTACTACA ACTTCGACGGCAATGTCCTT
CCACACCCTCTATCCTGCGCGGCGTGGA ACTACCGTCGCCGCACTCGCCAAAGCCGGTACAC
CGTGACCCCGTGAGCGCCATAACAAGCAGATTCGGCCACGATCTCATCTCCCATATCTACGCGGC
TGACGGCAGCGCCGACGTAATGCGCGACATCAGTGCATCCGGCGAGCCGGCGATTCCAAATATCA
AAGACCTACTGAACCCGAACATCAAAGCTGTTAACATGAACGAGCTCTGGGACACGCATCTCCA
GAAGTGGAATTACCAGATGGAGTACCTTGAGAAATGGCGGGAGGCTGAAGAAAAGGCCGGGAA
GGA ACTGGACCCATCATCGCGCCGATTACGCCTACCGCTGCGGTACGGCATGACCAGTTCCGGT
ACTATGGGTATGCCTCTGTGATCAACCTGCTGGATTTCACGAGCGTGGTTGTTCCGGTTACCTTTGC
GGATAAGAACATCGATAAGAAGAATGAGAGTTTCAAGGCGGTTAGTGAGCTTGATGCCCTCGTGC
AGGAAGAGTATGATCCGGAGGCGTATCATGGGGACCGGTTGCAGTGCAGGTTATCGGACGGAG
ACTCAGTGAAGAGAGGACGTTGGCGATTGCAGAGGAAGTGGGGAAAGTTGCTGGGAAATGTGGTG
ACTCCATAGCCCGGGGGGGGCTCGATCCCCTCGCGAGTTGGTTCACTGCTGCCTGAGGGTACCG
GCCGCAAATTAAGCCTTCGAGCGTCCCAAACCTTCTCAAGCAAGGTTTTTCAGTATAATGTTACA
TGCGTACACGCGTCTGTACAGAAAAAAGAAAAATTTGAAATATAAATAACGTTCTTAATACTA
ACATAACTATAAAAAAATAAATAGGGACCTAGACTTCAGGTTGTCTAACTCCTTCTTTTCGGTTAG
AGCGGATGTGGGGGGAGGGCGTGAATGTAAGCGTGACATAACTAATTACATGACTCGAGGTCGAC

TTACACACGTTGCTTCTTGTGTGGCAAGTCCTGTAAACCGAACTTAGGGATATCAGCAGTTGGAGT
GAATGGTATTCTTTTTGAAGCTACCTTCTTTCCGATGGTTCCACCTGAAATCCAATGTTTTGCAATT
CTCCATGCAATTCATCTAAAACACGCTCTACCATCGAATATGAAAGCAGGCTTAAACATCATCCTATG
GATTCTATTGAAATCTAATTCCTTGAACATATCCCATTAGTACAAATGACCATAGCGTGTGCATTC
TCACAGGCTTCGTACAAATCTGTACTTATGTGGACCAATTGAGAAACCCTGTCGTCAGCTGCAACA
CCAGGTTGACTCAAGTCAGTGATGATCTGCTCACGTGGGACCTTGGATCGTAGATATGTAECTTA
GCACCTTCATCCATCAATACTTAGAGATATAGATTGAACTACTCTCTCTAGTATCACCTGTATCCTT
CTTGAAAGCGAAACCTAACAAATGCGATTTTCTTATCGGTACGGTGTAAACAACAATCGATTAT
CCTAGTTGTAAACGTCTCCTTTGATAATCATTATCAATCAATCACTTGTGTCAGTACTTGGCCACTT
CGTGCAAGTTTAAACACCTCACACAAGTAAACCAAGTTCAAACGTCCTTCTGAAAACATGAACCT
CCAAATCCCCTGAAGCCTTCAAAAACCTGTTACCAATCTTTGATCCATACCAATAGCTCTGGCA
ACCTCTTCAACGTCAGCTCCTGTGGCTTCACATAAGGCACTAATTGAGTTGATTGAAGAAATTCTT
TGAGCTAAGAATGCGTTGGCTGCTAACTTACTCAACTCAGAAGACCAGGTGTTTGTGGTTATGATT
TTCTCAGATGGTACCCAGTGTTCGTATACGTACACAAAGCTCTAACAGCTTTCTGACCTTCAGGG
GTTTCGTCACCACCTATCAAACTCTATCAGGGTCTTCAAATCCTTAATGGCTGTACCCTCTGCCA
AAAACCTCTGGGTTACTCAATACCTGCAAGTTCAAATCTGGTTTAGTATTTGCATCGAAGATACGCT
TATTGATTCAGCAGCTCTAACTGGCACAGTAGATTTCTCTGTAAACAATCTGTATCCGTTACTATTCT
GTACTATTCTTCTAGCGCAAGCCTCAATGTATTTCAAGTCGGCTGCCCTTCCCTTACCCATACCGTA
AGTTTTTGTGGAGTGTGACTGAGATGAACACCAAATCAGCTTCTTGAATTGCACCATCAATGTC
AGTTGAGTAGAACAAATTCTTCCCCTGCATGACTCTACGACTTCTTCAAACCTGGTTCGTAGAT
AGGCAAAGTGTCACTATTCCAAGCATTGATCCTGGCTTGGTTCACATCCACAACAGTGACCTTAAT
GTCAGGGCACATCTGTGCAATGACAGAACAGGTTGGACCACCGACGTAACCGGCACCAATACAA
CAAATCTTCTGATCTGAAACATTTTTGGATCCACTAGTTCTAGATCCGTCGAAACTAAGTTCTTGG
TGTTTTAAACTAAAAAAAGACTAACTATAAAAGTAGAATTTAAGAAGTTTAAAGAAATAGATTTA
CAGAATTACAATCAATACCTACCGTCTTTATATACTTATTAGTCAAGTAGGGGAATAATTCAGGGA
ACTGGTTTAAACCTTTTTTTTTCAGCTTTTTTCCAATCAGAGAGAGCAGAAGGTAATAGAAGGTGTA
AGAAAATGAGATAGATACATGCGTGGTCAATTGCCTTGTGTCATCATTACTCCAGGCAGGTTGC
ATCACTCCATTGAGGTTGTGCCCGTTTTTTTGCCTGTTTGTGCCCTGTTCTCTGTAGTTGCGCTAAGA
GAATGGACCTATGAACTGATGGTTGGTGAAGAAAACAATATTTGGTGTCTGGGATTCTTTTTTTTTT
TGGATGCCAGCTTAAAAAGCGGGCTCATTATATTTAGTGGATGCCAGGAATAAACCTGTTACCC
AAGCACCATCAGTGTTATATATCTGTGTAAACCCGCCCTATTTTGGCATGTACGGGTTACAGCAG
AATTAAGGCTAATTTTTTACTAAATAAAGTTAGGAAAATCACTACTATTAATTATTACGTATTC
TTTGAATGGCAGTATTGATAATGATAAACTCGAGCCTGAGGCTGGACGACCTCGCGGAGTTCTAC
CGGCAGTGCAAATCCGTCGGCATCCAGGAAACCAGCAGCGGCTATCCGCGCATCCATGCCCCCG
AACTGCAGGAGTGGGGAGGCACGATGGCCGCTTTGGTCGATCTAGATTACGTGGAAGAAAGGTA
GTAAAAGTAGTAGTATAAGTAGTAAAAAGAGGTAAAAAGAGAAAACCGGCTACATACTAGAGAA
GCACGTACACAAAAACTCATAGGCACTTCATCATAACGACAGTTTCTTGTATGATTATAATAGTGTAT
TAGATATTTTCAAGAAATATGCATAGAACCTCCTCTTGCCTTACTTTTTTATACATAGAACATTGGCAG
ATTTACTTACACTACTTTGTTTCTACGCCATTTCTTTTGTTTTCAACACTTAGACAAGTTGTTGAGAA
CCGGACTACTAAAAAGCAATGTTCCCCTGAAAATCATGTACCTGCAGCATAATAACCCCTAATT
CTGCATCGATCCAGTATGTTTTTTTTTCTTACTCATTTTTTACCTGAAGATAGAGCTTCTAAAACAAA
AAAAATCAGTGATTACATGCATATTGTGTGTTCTAGTAACCAAAGGAAAGGAACAGATAGATAAA
ATTCCGAGACTGTCAAATTAGGTTTTTTTTTCTTTTTTTTTTGGCGGGAGTCAGTGGGCCGAAATATGTT
CTTGGCCTAGAACTTAATCTGGTTTGTATCATGCCAATACTTGCTGAGTGCCCGACTTTTTGCCAC

CCTCTTGCCTTCTGTCATCCTTCAAACCCACCTGTTTTCCAGCCGTATCTTCGCTCGCATCTACAC
ATACTGTGCCATATCTTGTGTGTAGCCGGACGTGACTATGACCAAAAACAAACAAGGAGAACTGT
TCGCCGATTTGTAACACTCCTGCATCCATCCAAGTGGGTATGCGCTATGCAATGTTAAGCTAGGTC
AGGTCAGACCAGGTCCAAGGACAGCAACTTGACTGTATGCAACCTTTACCATCTTTGCACAGAAC
ATACTTGTAGCTAGCTAGTTACACTTATGGACCGAAAAGGCACCCCACCATGTCTGTCCGGCTTTA
GAGTACGGCCGCAGACCGCTGATTTGCCCTGCCAAGCAGTAGTACAATGCATCGCATGAGCACA
CGGGCACGGGCACGGGCACAGGAACCATTGGCAAAAATACCAGATACTATACCGACGTATATC
AAGCCCAAGTTTAAAATTCTAAATTTCCGCGGCTACTTTTTCAATTCCTATAGTGAGTCGTATTA
ATTGTAATCATGTCATAGCTGTTTCTGTGTGAAATTGTTATCCGCTCACAATTCACACAACATA
CGAGCCGGAAGCATAAAGTGTAAGCCTGGGGTGCCTAATGAGTGAGCTAACTCACATTAATTGC
GTTGCGCTCACTGCCCGCTTCCAGTCGGGAAACCTGTCGTGCCAGCTGCATTAATGAATCGGCCA
ACGCGCGGGGAGAGGGCGGTTTTCGTATTGGGCGCTCTTCCGCTTCCCTCGCTCACTGACTCGCTGCG
CTCGGTGCTTCGGCTGCGGCGAGCGGTATCAGCTCAAAAGGCGGTAATACGGTTATCCACAG
AATCAGGGGATAACGCAGGAAAGAACATGTGAGCAAAAAGGCCAGCAAAAAGGCCAGGAACCGTA
AAAAGGCCGCGTTGCTGGCGTTTTTCCATAGGCTCCGCCCCCTGACGAGCATCACAAAATCGA
CGCTCAAGTCAGAGGTGGCGAAACCCGACAGGACTATAAAGATAACCAGGCGTTTCCCCCTGGAA
GCTCCCTCGTGCCTCTCCTGTTCCGACCCTGCCGTTACCGGATACCTGTCCGCCTTTCTCCCTTC
GGGAAGCGTGGCGCTTCTCATAGCTCACGCTGTAGGTATCTCAGTTCGGTGTAGGTGCTTCGCTC
CAAGCTGGGCTGTGTGCACGAACCCCCGTTACGCCGACCGCTGCGCCTTATCCGGTAACTATC
GTCTTGAGTCCAACCCGTAAGACACGACTTATCGCCACTGGCAGCAGCCACTGGTAACAGGATT
AGCAGAGCGAGGTATGTAGGCGGTGCTACAGAGTTCTTGAAGTGGTGGCCTAACTACGGCTACAC
TAGAAGAACAGTATTTGGTATCTGCGCTCTGCTGAAGCCAGTTACCTTCGGAAAAAGAGTTGGTA
GCTCTTGATCCGGCAAACAAACCACCGCTGGTAGCGGTGGTTTTTTTTGTTTGAAGCAGCAGATTA
CGCGCAGAAAAAAGGATCTCAAGAAGATCCTTTGATCTTTTCTACGGGGTCTGACGCTCAGTGG
AACGAAAACACTCAGTTAAGGGATTTTGGTCATGAGATTATCAAAAAGGATCTTACCTAGATCCTT
TTAAATTAATAAATGAAGTTTTAAATCAATCTAAAGTATATATGAGTAAACTGGTCTGACAGTTACC
AATGCTTAATCAGTGAGGCACCTATCTCAGCGATCTGTCTATTTTCGTTTCCATAGTTGCCTGACT
CCCCGTCGTGTAGATAACTACGATACGGGAGGGCTTACCATCTGGCCCCAGTGTGCAATGATAACC
GCGAGACCCACGCTCACCGGCTCCAGATTTATCAGCAATAAACCAGCCAGCCGGAAGGGCCGAG
CGCAGAAGTGGTCTGCAACTTTATCCGCTCCATCCAGTCTATTAATTGTTGCCGGAAGCTAGA
GTAAGTAGTTCCGCCAGTTAATAGTTTTCGCAACGTTGTTGCCATTGCTACAGGCATCGTGGTGTCA
CGCTCGTCTGTTTGGTATGGCTTCATTACGCTCCGGTTCCTAACGATCAAGGCGAGTTACATGATCC
CCCATGTTGTGCAAAAAGCGGTTAGCTCCTTCGGTCTCCGATCGTTGTCAGAAGTAAGTTGGCC
GCAGTGTTATCACTCATGGTTATGGCAGCACTGCATAATTCTTACTGTGTCATGCCATCCGTAAGAT
GCTTTTCTGTGACTGGTGAAGTACTCAACCAAGTCATTCTGAGAATAGTGTATGCGGGCAGCCGAGTT
GCTCTTGCCCGGCGTCAATACGGGATAATACCGCGCCACATAGCAGAACTTTAAAAGTGCTCATC
ATTGGAAAACGTTCTTCGGGGCGAAAACCTCTCAAGGATCTTACCGCTGTTGAGATCCAGTTCGATG
TAACCCACTCGTGCACCCAAGTATCTTACGATCTTTTACTTTCACCAGCGTTTCTGGGTGAGCA
AAAACAGGAAGGCAAAAATGCCGCAAAAAGGGGAATAAGGGCGACACGGAAATGTTGAATACTC
ATACTCTTCCTTTTCAATATTATTGAAGCATTATCAGGGTTATTGTCTCATGAGCGGATACATATT
GAATGTATTTAGAAAAATAAACAATAGGGGTTCCGCGCACATTTCCCCGAAAAGTGCCACCTGA
CGCGCCCTGTAGCGGCGCATTAAAGCGCGGCGGGTGTGGTGGTTACGCGCAGCGTGACCGCTACAC
TTGCCAGCGCCCTAGCGCCCGCTCCTTTTCGCTTCTTCCCTTCTTCTCGCCACGTTTCGCCGGCTTT
CCCCGTCAAGCTCTAAATCGGGGGCTCCCTTTAGGGTTCCGATTTAGTGCTTTACGGCACCTCGAC

CCCAAAAA ACTTGATTAGGGTGATGGTTCACGTAGTGGGCCATCGCCCTGATAGACGGTTTTTCGC
 CCTTTGACGTTGGAGTCCACGTTCTTTAATAGTGGACTCTTGTTCAAA ACTGGAACAACACTCAAC
 CCTATCTCGGTCTATTCTTTTGATTATAAGGGATTTTGCCGATTTCCGGCCTATTGGTTAAAAAATGA
 GCTGATTAAACAAAAATTTAACGCGAATTTTAACAAAATATTAACGCTTACAATTTCCATTTCGCCAT
 TCAGGCTGCGCAACTGTTGGGAAGGGCGATCGGTGCGGGCCTCTTCGCTATTACGCCAGCTGGCG
 AAAGGGGGATGTGCTGCAAGGCGATTAAGTTGGGTAAACGCCAGGGTTTTCCAGTCACGACGTTG
 TAAAACGACGGCCAGTGCCAAGCTCCC GCGGGGATCGACTCATAAAATAGTAACCTTCTAATGCG
 TATCTATTGACTACCAACCATTAGTGTGGTTGCAGAAGGCGGAATTTCCCTTCTTCGAATTTAGCT
 TGCTTTTTCATTTTTATTTTCCATTTTTCAGTTTTTGTGGTGTGTCGAATTTAGCCAGTTGCTTCTCAA
 GATGAAAAAACCCTGCGCAGTTTCTGTGCTGCAAGATCCTAATCGACTTTTCCACCCCCACA
 AAAGTAAATGTTCTTTTGTTACATTCGCGTGGGTAGCTAGCTCCCCGAATCTTCAAAGGACTTAGG
 GACTGCACTACATCAGAGTGTGTTACCTGGTTTGTGCTGCCTGGTTTGAAGAAAAGAGCAGGGAA
 CTCGCGGGTTCCCGGCGAATAATCATGCGATAGTCTTTGGCCTTCCAAGTCGCATGTAGAGTAGA
 CAACAGACAGGGAGGGCAGGAAGGATCTTCACTGAGATCCTGTATCTTGTGGGTAAAGTCGGAT
 GAAAGGGGAATCGTATGAGATTGGAGAGGATGCGGAAGAGGTAACGCCTTTTGTAACTTGTTTA
 ATTATTATGGGGCAGGCGAGAGGGGGAGGAATGTATGTGTGTGAGGCGGGCAGACGGAGCCAT
 CCAGGCCAGGTAGAAATAGAGAAAGCCGAATGTTAGACAATATGGCAGCGTAGTAGAGTAGGTA
 GGTAGGCAAGTACTGCTAGCAAAGAGGAGAAGGGTAAGTCTACTCTTCGCATTCCACACCGTTAG
 TGTGTCAGTTTGAACAAAAACAATCATCATACCAATTGATGGACTGTGGACTGGCTTTTGGAA
 CGGCTTTTCGGACTGCGATTATTCGTGAGGAATCAAGGTAGGAATTTGGTCATATTACGGACAAC
 AGTGGGTGATTCCCATATCGAGTAGGAAAACGAGATCATGGTATCCTCAGATATGTTGCGGAAATC
 TGTTACCCGCAAAGTTCAGGGTGCTCTGGTGGGTTTCGGTTGGTCTTTGCTTTGCTTCTCCCTTGT
 TTGCATGTTAATAATAGCCTAGCCTGTGAGCCGAAACTTAGGGTAGGCTTAGTGTGGAACGTACA
 TATCTATCACGTTGACTTGGTTAACCAGGCGACCTGGTAGCCAGCCATACCCACACAGTTTTTTG
 TATCTTCAGTATAGTTGTGAAAAGTGTAGCGGAAATTTGTGGTCCGAGCAACAGCGTCTTTTTCTA
 GTAGTGCGGTCGGTTACTTGGTTGACATTGGTATTTGGACTTTGTGCTACACCATTCACTACTTGA
 AGTCGAGTGTGAAGGGTATGATTTCTAGTGGTGAACACCTTTAGTTACGTAATGTTTTATTGCTGT
 TTTACTTGAGATTTTCGATTGAGAAAAGGTATTTAATAGCTCGAATCAATGTGAGAACAGAGAGA
 AGATGTTCTTCCCTAACTCGAAAGGTATATGAGGCTTGTGTTTCTTAGGAGAATTATTATTCTTTGT
 TATGTTGCGCTTGTAGTTGAAAAGGTGAAGAGACAAAAGCTGGAATTGTGAGCGGATAACAAG
 CTCAACACTTGAAATTTAGGAAAAGAGCAGAATTTGGCAAAAAAATAAAAAAATAAACAC
 ACATACTCATCGAG

Sequence S08. Sequence of the 14140 PB plasmid pK_{LAC2}-BP. The coding sequence of *hasAP* gene is highlighted in green, the GPD Promoter and CYC1 terminator is highlighted in yellow and the Coding Sequence of *hasB* gene is highlighted in grey.

AAGCTTATGAATACCTTATCTCAAGCCATCAAGGCATACAATTCAAATGACTATCAATTGGCTTTGA
 AATTGTTGAAAAGTCAGCAGAAATCTACGGACGTAAGATAGTAGAGTTTCAGATTACTAAGTGC
 AAGGAGAAATTGTCTGCCATCCAAGTGTCAATTCAGCTCATCCTTCAGTCAACTCAGCACATTTG
 TCAGTAAACAAAGAGGAAAAGGTTAATGTGTGCGATTCTCCATTGGATATTGCTACCCAATTGTG
 TTGTCAAATGTCAAGAAATTAGTGTATCTGACAGTGAGAAGAACACATTGAAGAATAAGTGGAA
 GTTGTTAACTGAAAAGAAAAGTGAGAATGCTGAAGTTCGTGCTGTAGCATTGGTACCAAAGGATT

TCCCAAAGGATTTGGTGTGGCACCATTACCTGACCATGTGAATGACTTTACTTGGTACAAGAAGA
GAAAGAAACGTTTAGGTATCAAACCAGAACATCAACACGTGGGTTTGTCAATAATTGTCACCACT
TTCAATCGTCCTGCAATCTTAAGTATAACTTTGGCATGCTTAGTTAATCAAAAAGACTCACTATCCAT
TCGAGGTGATTGTCACAGATGATGGATCACAAGAAGATTTGTCTCCAATCATAAGACAATATGAA
AACAAATTGGATATCCGTTATGTCAGACAAAAGGACAATGGTTTCCAAGCTAGTGCTGCTAGGAA
TATGGGTTTGAGATTAGCAAAGTATGATTTCAATTGGTTTGTGGATTGCGATATGGCACCTAACCCA
TTATGGGTGCATTATATGTCGCTGAATTGTTAGAAGATGATGATTGACAATCATTGGACCAAGAA
AGTACATTGATACACAACATATCGACCCAAAGGACTTCTTAAACAATGCATCTTTGTTGGAATCAT
TGCCAGAAGTTAAGACCAATAACTCAGTGGCCGCAAAGGTGAAGTACCGTTTCATTGGATTGG
AGGTTGGAGCAATTCGAAAAGACTGAAAACCTTAAGATTGTCAGACTCTCCTTTAGATTCTTCGCA
GCTGGTAATGTTGCTTTCCGCAAGAAGTGGTTGAACAATCTGGATTCTTTGATGAAGAGTTCAAC
CATTGGGGTGGTGAAGATGTTGAGTTGGATATAGATTGTTTAGGTATGGTTCATTCTTCAAGACTA
TTGACGGTATCATGGCCTACCATCAAGAGCCACCTGGTAAGGAAAACGAAACAGATAGGGAAGC
TGGAAGAACATCACATTGGATATTATGAGGGAGAAGGTACCATATATTTACAGGAAGTTGTTGCC
TATCGAAGATTCACACATCAATAGAGTCCCTTTGGTTTCTATCTATATCCAGCTTACAACGTGCC
AATTATATTCAACGTTGTGTTGATTCTGCCTGAACCAGACAGTTGTAGATTGGAAGTCTGTATTT
GCAATGATGGTTCACAGATAATACTTTGGAAGTTATCAACAAGTTGTACGGTAACAATCCAAGAG
TCAGAATCATGAGTAAACCAAATGGTGGTATTGCTAGTGCTTCTAATGCAGCAGTGAGTTTTGCCA
AAGGATATTACATAGGTCAATTAGATTGAGATGACTATTTGGAGCCAGATGCCGTAGAGTTATGTTT
GAAAGAGTTCTTGAAAGACAAAACCTTTGGCTTGTGTATATACAACAACAGAAATGTCAATCCTG
ATGGTCTTTGATAGCAAATGGTTACAACCTGGCCAGAGTTTAGTAGGGAGAAGTTGACTACTGCAA
TGATTGCTCATCACTCCGTATGTTCACTATCAGGGCATGGCATTGACCCGATGGTTTTAATGAGAA
GATTGAGAATGCTGTGGACTACGATATGTTCTTGAAGTTGAGTGAAGTTGGTAAGTTCAAGCACTT
AAACAAAATCTGCTATAACAGGGTATTGCATGGTGATAATACAAGTATTAAGAAGTTGGGTATCCA
AAAGAAGAACCATTTTCGTGGTCGTCAACCAGAGTTTGAACAGGCAAGGAATCACTTACTACAATT
ACGACGAGTTCGATGACTTAGATGAGTCTAGGAAATACATCTTTAACAACAACAGCTGAGTACCAG
GAAGAAATTGACATCTTAAAGGACATTAAGATCATACAAAAACAAGGACGCTAAAATAGCAGTATC
TATCTTCTACCCAAATACTTTGAATGGTTTGGTCAAGAAATTGAATAACATCATCGAGTACAACAA
GAACATATTCGTTATTGTCTTGCATGTGGACAAGAACCATTTGACCCCAGATATCAAGAAAGAGAT
ATTGGCTTTCTACCACAAGCATCAAGTGAATATTTTGTGTAATAACGATATCTCATACTACACATCA
AACCCTTTAATCAAGACCGAGGCACATTTATCAAACATTAATAAGTTGTCACAGTTGAACTTGAAT
TGTGAATATATCATATTCGACAATCATGACTCTTTGTTTCGTGAAGAATGATTCTTATGCCTATATGAA
GAAGTACGATGTTGGTATGAATTTCTCAGCCTTAACTCATGATTGGATTGAAAAGATTAACGCACA
TCCACCATTCAAGAAGTTGATTAAGACATACTTAAACGATAATGACTTGAAATCTATGAACGTTAA
AGGAGCTAGTCAAGGAATGTTTATGACATATGCATTGGCTCACGAATTGTTGACTATTATCAAAGA
GGTATCACTTCTTGCCAATCTATCGATTCTGTACCAGAATACAACACTGAGGACATATGGTTTCAA
TTTGCATTGTTGATCTTGAAAAGAAAACCTGGTCATGTCTTTAACAAGACAAGTACCTTGACATAC
ATGCCTTGGGAGAGGAAGTTGCAATGGACCAATGAACAATTGAATCAGCTAAACGTGGAGAAA
ACATTCCAGTGAACAAGTTCAATCAATTCAATCACATTGTAAAGGCCTTGAATCGAGAATTTAT
ACTTAGATAAGTATGACTTACAGGTATATTTCTATGAGATACTGATGTATACATGCATGATAATATTT
AAACGGTTATTAGTGCCGATTGTCTTGTGCGATAATGACGTTCCCTATCAAAGCAATACACTTACCAC
CTATTACATGGGCCAAGAAAATATTTTCGAACTTGTGTTAGAATATTAGCACAGAGTATATGATGTTA
TCCGTTAGATTATGCATGATTCATTCCCTACAACCTTTTCGTAGCATAAGGATTAATTAATTTGGATGCC
AATAAAAAAAAAAAAAACATCGAGAAAATTTACAGCATGCTCAGAAACAATTGCAGTGTATCAAAGT

AAAAAAAAAGATTTTCACTACATGTTCCTTTTGAAGAAAGAAAATCATGGAACATTAGATTTACAA
AAATTTAACCACCGCTGATTAACGATTAGACCGTTAAGCGCACAAACAGGTTATTAGTACAGAGAA
AGCATTCTGTGGTGTGCCCCGGACTTTCTTTTGGCAGATAGGTAAATCGAATACCATCATACTATC
TTTTCCAATGACTCCCTAAAGAAAGACTCTTCTTCGATGTTGTATACGTTGGAGCATAGGGCAAGA
ATTGTGGCTTGAGATCATCTTTTGTGTTTCCGGGTGTACAATATGGACTTCCTCTTTTCTGGCAAC
CAAACCCATACATCGGGATTCTATAATACCTTCGTTGGTCTCCCTAACATGTAGGTGGCGGAGGG
GAGATATACAATAGAACAGATAACCAGACAAGACATAATGGGCTAAACAAGACTACACCAATTAC
ACTGCCTCATTGATGGTGGTACATAACGAATAACTGTAGCCCTAGACTTGATAGCCATCATCAT
ATCGAAGTTTCACTACCCTTTTCCATTTGCCATCTATTGAAGTAATAATAGGCGCATGCAACTTCTT
TTCTTTTTTTTTCTTTCTCTCTCCCCGTTGTTGTCTCACCATATCCGCAATGACAAAAAATGATG
GAAGACACTAAAGAAAAAATTAACGACAAAGACAGCACCAACAGATGTGCTTGTCCAGAGCT
GATGAGGGGTATCTCGAAGCACACGAAACTTTTTCTTCCTTCCTTCATTCACGCACACTACTCTCTAAT
GAGCAACGGTATACGGCCTTCTTCCAGTTACTTGAATTTGAAATAAAAAAAGTTTGTGTCTTG
CTATCAAGTATAAATAGACCTGCAATTATTAATCTTTTGTTCCTCGTCATTGTTCTCGTTCCCTTTCT
TCCTTGTTCCTTTTCTGCACAATATTTCAAGCTATAACCAAGCATAACAATCAAGCAATTCCAGATCT
GCCACCATGCCTCAATCCTGGGAAGAACTGGCCGCTGATAAGCGCGCCCGCCTCGAAAAACCA
TCCCTGATGAATGGAAAGTCCAGACGCTGCCTGCGGAAGACAGCGTTATTGATTTCCCAAAGAAA
TCGGGCATCCTTTCAGAGGCCGAAGTGAAGATCACAGAGGCTTCCGCTGCGGATCTTGTGTCCAA
GCTGGCGGCCGGAGAGTTGACCTCGGTGGAAGTTACGCTAGCATTCTGTAAACGGGCAGCAATCG
CCCAGCAGTTAACAAACTGCGCCCACGAGTTCTTCCTGACGCCGCTCTCGCGCAGGCAAGGGA
ACTCGATGAATACTACGCAAAGCACAAGAGACCCGTTGGTCCACTTCATGGCCTCCCCATCTCTCT
CAAAGACCAGCTTCGAGTCAAGGGCTACGAAACATCAATGGGCTACATCTCATGGCTAAACAAGT
ACGACGAAGGGGACTCGGTTCTGACAACCATGCTCCGCAAAGCCGGTGCCGCTTCTACGTCAAG
ACCTCTGTCCCGCAGACCCTGATGGTCTGCGAGACAGTCAACAACATCATCGGGCGCACCGTCAA
CCCACGCAACAAGAAGTGGTCGTGCGGCGGCAGTTCTGGTGGTGAAGGTGCGATCGTTGGGATTC
GTGGTGGCGTCATCGGTGTAGGAACGGACATCGGTGGCTCGATTGAGTGCCGGCCGCGTTCAAC
TTCTGTACGGTCTAAGGCCGAGTCATGGGCGGCTGCCGTATGCAAAGATGGCGAACAGCATGGA
GGGTCAGGAGACGGTGCACAGCGTTGTGCGGCGGATTACGCACTCTGTTGAGGACCTCCGCTCT
TCACCAAATCCGTCCTCGGTGAGGAGCCTTGGAAATACGACTCCAAGGTATCCCCATGCCCTGG
CGCCAGTCCGAGTCGGACATTATTGCCTCCAAGATCAAGAACGGCGGGCTCAATATCGGCTACTA
CAACTTCGACGGCAATGTCCTTCCACACCCCTCTATCCTGCGCGGCGTGGAAGTACCCTCGCCG
CACTCGCCAAAGCCGGTCACACCGTGACCCCGTGGACGCCATAACAAGCACGATTTCCGGCCACGA
TCTCATCTCCATATCTACGCGGTGACGGCAGCGCCGACGTAATGCGCGACATCAGTGCATCCGG
CGAGCCGGCGATTCCAAATATCAAAGACCTACTGAACCCGAACATCAAAGCTGTTAACATGAACG
AGCTCTGGGACACGCATCTCCAGAAGTGAATTACCAGATGGAGTACCTTGAGAAATGGCGGGA
GGCTGAAGAAAAGCCGGGAAGGAACTGGACGCCATCATCGCGCCGATTACGCTACCGCTGCG
GTACGGCATGACCAGTTCGGTACTATGGGTATGCCTCTGTGATCAACCTGCTGGATTTACGAGC
GTGGTTGTTCCGGTTACCTTTGCGGATAAGAACATCGATAAGAAGAATGAGAGTTTCAAGGCGGTT
AGTGAGCTTGATGCCCTCGTGCAGGAAGAGTATGATCCGGAGGCGTATCATGGGGCACCGGTTGC
AGTGCAGGTTATCGGACGGAGACTCAGTGAAGAGAGGACGTTGGCGATTGCAGAGGAAGTGGGG
AAGTTGCTGGGAAATGTGGTACTCCATAGCCCGGGGGGGCTCGATCCCCTCGCGAGTTGGTTC
AGCTGCTGCCTGAGGGTACCGGCCGCAAATTAAGCCTTCGAGCGTCCCAAACCTTCTCAAGCA
AGGTTTTAGTATAATGTTACATGCGTACACGCGTCTGTACAGAAAAAAGAAAAATTTGAAAT
ATAAATAACGTTCTTAATACTAACATAACTATAAAAAAATAAATAGGGACCTAGACTTCAGGTTGT

CTAACTCCTTCCTTTTCGGTTAGAGCGGATGTGGGGGGAGGGCGTGAATGTAAGCGTGACATAACT
AATTACATGACTCGAGGTCGACTTACACACGTTGCTTCTTGTGTGGCAAGTCCTGTAAACCGAACT
TAGGGATATCAGCAGTTGGAGTGAATGGTATTCTTTTTGAAGCTACCTTCTTCCGATGGTTCCAC
CTGAAATCCAATGTTTTGCAATTCTCCATGCAATTCATCTAAAACACGTCTACCATCGAATATGAAA
GCAGGCTTTAACATCATCCTATGGATTCTATTGAAATCTAATTCCTTGAACATATCCCATTGAGTACA
AATGACCATAGCGTGTGCATTCTCACAGGCTTCGTACAAATCTGTAATTATGTGGACCAATTGAGA
AACCCTGTCGTGAGCTGCAACACCAGGTTGACTCAAGTCAGTGATGATCTGCTCACGTGGGACCT
TTGGATCGTAGATATGAACTTAGCACCTTCATCCATCAAATACTTAGAGATATAGATTGAACTACT
CTCTCTAGTATCACCTGTATCCTTCTTGAAAGCGAAACCTAACAATGCGATTTTCTTATCGGTCACG
GTGTTAAACAAACAATCGATTATCCTAGTTGTAACACGTCTCCTTTGATAATCATTATCATATCAATCA
CTTGTTGCCAGTACTTGGCCACTTCGTGCAAGTTTAAACACCTCACACAAGTAAACCAAGTTCAA
ACGTCCTTCTGAAAACATGAACCTCCAAATCCCCTGAAGCCTTCAAAAACCTGTTACCAATTCTT
TGATCCATACCAATAGCTCTGGCAACCTCTTCAACGTGAGTCTCTGTGGCTTACATAAGGCACTA
ATTGAGTTGATTGAAGAAATCTTTGAGCTAAGAATGCGTTGGCTGCTAACTTACTCAACTCAGAA
GACCAGGTGTTTGTGGTTATGATTTTCTCAGATGGTACCCAGTGTTTCGTATACGTCACACAAAGCTC
TAACAGCTTTCTGACCTTCAGGGGTTTCGTACCACCTATCAAACTCTATCAGGGTTCTTCAAATC
CTTAATGGCTGTACCCTCTGCCAAAACTCTGGGTTACTCAATACCTGCAAGTTCAAATCTGGTTA
GTATTTGCATCGAAGATACGTCTTATTGATTGAGCAGCTCTAACTGGCACAGTAGATTCTCTGTAA
CAATCTTGTATCCGTTACTATTCTGTACTATTCTTCTAGCGCAAGCCTCAATGTATTTCAAGTCGGCT
GCCCTCCCTTACCCATACCGTAAGTTTTTGTGGAGTGTGACTGAGATGAACACCAAATCAGCT
TCTTGAATTGCACCATCAATGTCAGTTGAGTAGAACAATTCTTCCCCTGCATGACTCTACGACTT
CCTTCAAACCTGGTTTCGTAGATAGGCAAAGTGTCATATTCCAAGCATTGATCCTGGCTTGGTTCA
CATCCACAACAGTGACCTTAATGTCAGGGCACATCTGTGCAATGACAGAACAGGTTGGACCACCG
ACGTAACCGGCACCAATACAACAATCTTCTTGATCTGAAACATTTTTGGATCCACTAGTTCTAGA
TCCGTCGAAACTAAGTTCTTGGTGTTTTAAAACTAAAAAAGACTAACTATAAAAGTAGAATTTA
AGAAGTTTAAAGAAATAGATTTACAGAATTACAATCAATACCTACCGTCTTTATATACTTATTAGTCA
AGTAGGGGAATAATTTACAGGAACTGGTTTAAACCTTTTTTTTTCAGCTTTTCCAAATCAGAGAGA
GCAGAAGGTAATAGAAGGTGTAAGAAAATGAGATAGATACATGCGTGGGTCAATTGCCTTGTGTC
ATCATTACTCCAGGCAGGTTGCATCACTCCATTGAGGTTGTGCCGTTTTTTGCCTGTTTGTGCCCT
GTTCTCTGTAGTTGCGCTAAGAGAATGGACCTATGAACTGATGGTTGGTGAAGAAAACAATATTTT
GGTGCTGGGATTCTTTTTTTTTCTGGATGCCAGCTTAAAAAGCGGGCTCCATTATATTTAGTGGATG
CCAGGAATAAACCTGTTACCCAAGCACCATCAGTGTTATATATTCTGTGTAACCCGCCCTTATT
TGGCATGTACGGGTACAGCAGAATTAAGGCTAATTTTTTACTAAATAAAGTTAGGAAAATCA
CTACTATTAATTATTTACGTATTCTTTGAAATGGCAGTATTGATAATGATAAACTCGAGCCTGAGGCT
GGACGACCTCGCGGAGTTCTACCGGCAGTGCAAATCCGTCGGCATCCAGGAAACCAGCAGCGGC
TATCCGCGCATCCATGCCCCGAACTGCAGGAGTGGGGAGGCACGATGGCCGCTTTGGTTCGATCT
AGATTACGTGGAAGAAAGGTAGTAAAAGTAGTAGTATAAGTAGTAAAAGAGGTA AAAAGAGAA
AACCGGCTACATACTAGAGAAGCACGTACACAAAACTCATAGGCACTTCATCATAACGACAGTTT
CTTGATGCATTATAATAGTGTATTAGATATTTTTCAGAAATATGCATAGAACCTCCTCTTGCCTTACTT
TTTATACATAGAACATTGGCAGATTTACTTACACTACTTTGTTTCTACGCCATTTCTTTTGTTTTCAAC
ACTTAGACAAGTTGTTGAGAACCGGACTACTAAAAAGCAATGTTCCCACTGAAAATCATGTACCT
GCAGCATAATAACCCCTAATTCTGCATCGATCCAGTATGTTTTTTTTTCTACTCATTTTTTACCTG
AAGATAGAGCTTCTAAAACAAAAAATCAGTGATTACATGCATATTGTGTGTTCTAGTAACCAA
GGAAAGGAACAGATAGATAAAATCCGAGACTGTCAAATTAGGTTTTTTTTCTTTTTTTTTGGCGGG

AGTCAGTGGGCCGAAATATGTTCTTGGCCTAGAACTTAATCTGGTTTGATCATGCCAATACTTGCCT
GAGTGCCCGACTTTTTGCCACCCTCTTGCCTTCTGTCATCCTTCAAACCCACCTGTTTTCCAGCC
GTATCTTCGCTCGCATCTACACATACTGTGCCATATCTTGTGTGTAGCCGGACGTGACTATGACCAA
AAACAAACAAGGAGAACTGTTCCGCCGATTTGTAACACTCCTGCATCCATCCAAGTGGGTATGCGC
TATGCAATGTTAAGCTAGGTCAGGTCAGACCAGGTCCAAGGACAGCAACTTGACTGTATGCAACC
TTTACCATCTTTGCACAGAACATACTTGTAGCTAGCTAGTTACACTTATGGACCGAAAAGGCACCC
CACCATGTCTGTCCGGCTTTAGAGTACGGCCGCAGACCGCTGATTTGCCTTGCCAAGCAGTAGTCA
CAATGCATCGCATGAGCACACGGGCACGGGCACGGGCACAGGAACCATTGGCAAAAATACCAG
ATACACTATAACCGACGTATATCAAGCCCAAGTTTAAAATTCCTAAATTTCCGCGGCTACTTTTTCAAT
TCCCTATAGTGAGTCGTATTAATTCGTAATCATGTATAGCTGTTTCTGTGTGAAATTGTTATCCG
CTCACAATTCACACAACATACGAGCCGGAAGCATAAAGTGTAAGCCTGGGGTGCCTAATGAGT
GAGCTAACTCACATTAATTGCGTTGCGCTCACTGCCCCGTTTCCAGTCGGGAAACCTGTCTGTGCCA
GCTGCATTAATGAATCGGCCAACGCGCGGGGAGAGGCGGTTTGCCTATTGGGCGCTCTTCCGCTTC
CTCGCTCACTGACTCGCTGCGCTCGGTCTGCGGCTGCGGCGAGCGGTATCAGCTCACTCAAAGG
CGGTAATACGGTTATCCACAGAATCAGGGGATAACGCAGGAAAGAACATGTGAGCAAAGGCCA
GCAAAGGCCAGGAACCGTAAAAAGGCCGCGTTGCTGGCGTTTTTCCATAGGCTCCGCCCCCTG
ACGAGCATCACAAAATCGACGCTCAAGTCAGAGGTGGCGAAACCCGACAGGACTATAAAGATA
CCAGGCGTTTTCCCCTGGAAGCTCCCTCGTGCCTCTCCTGTTCCGACCCTGCCGTTACCGGATA
CCTGTCCGCTTTTCTCCCTTCGGGAAGCGTGGCGCTTTCATAGCTCACGCTGTAGGTATCTCAGT
TCGGTGTAGGTCGTTCCGCTCCAAGCTGGGCTGTGTGCACGAACCCCCGTTTCCAGCCCCACCGCTG
CGCTTATCCGGTAACTATCGTCTTGAAGTCCAACCCGGTAAGACACGACTTATCGCCACTGGCAGC
AGCCACTGGTAACAGGATTAGCAGAGCGAGGTATGTAGGCGGTGCTACAGAGTTCTTGAAGTGGT
GGCCTAACTACGGCTACACTAGAAGAACAGTATTTGGTATCTGCGCTCTGCTGAAGCCAGTTACCT
TCGGAAAAAGAGTTGGTAGCTCTTGTATCCGGCAAACAAACCACCGCTGGTAGCGGTGGTTTTTTT
GTTTGCAAGCAGCAGATTACGCGCAGAAAAAAGGATCTCAAGAAGATCCTTTGATCTTTTCTAC
GGGTCTGACGCTCAGTGAACGAAAACACTCACGTTAAGGGATTTGGTTCATGAGATTATCAAAAA
GGATCTTACCTAGATCCTTTTAAATTAATAAATGAAGTTTTAAATCAATCTAAAGTATATATGAGTA
AACTTGGTCTGACAGTTACCAATGCTTAATCAGTGAGGCACCTATCTCAGCGATCTGTCTATTTCTG
TCATCCATAGTTGCCCTGACTCCCCGTCGTGTAGATAACTACGATACGGGAGGGCTTACCATCTGGC
CCCAGTGCTGCAATGATACCGCGAGACCCACGCTACCGGCTCCAGATTTATCAGCAATAAACA
GCCAGCCGGAAGGGCCGAGCGCAGAAAGTGGTCTGCAACTTTATCCGCTCCATCCAGTCTATTA
ATTGTTGCCGGAAGCTAGAGTAAGTAGTTCGCCAGTTAATAGTTTGCGCAACGTTGTTGCCATTG
CTACAGGCATCGTGGTGTACGCTCGTCTGTTTGGTATGGCTTCAATCAGCTCCGGTCCCAACGATC
AAGGCGAGTTACATGATCCCCATGTTGTGCAAAAAAGCGGTTAGCTCCTTCGGTCTCCGATCGT
TGTCAGAAGTAAGTTGGCCGAGTGTATCACTCATGGTTATGGCAGCACTGCATAATTCTCTTACT
GTCATGCCATCCGTAAGATGCTTTTCTGTGACTGGTGAAGTACTCAACCAAGTCATTCTGAGAATAG
TGTATGCGGCGACCGAGTTGCTCTTGCCCGGCTCAATACGGGATAATACCGCGCCACATAGCAG
AACTTTAAAAGTGCTCATCATTGAAAACGTTCTTCGGGGCGAAAACCTCTCAAGGATCTTACCGCT
GTTGAGATCCAGTTCGATGTAACCCACTCGTGCACCCAAGTACTGATCTTACGATCTTTTACTTTACC
AGGTTTTCTGGGTGAGCAAAAACAGGAAGGCAAAATGCCGCAAAAAGGGAATAAGGGGCGACA
CGGAAATGTTGAATACTCATACTCTTCTTTTCAATATTATTGAAGCATTATCAGGGTTATTGTCT
CATGAGCGGATACATATTTGAATGTATTTAGAAAAATAAACAATAGGGGTTCCGCGCACATTTCC
CCGAAAAGTGCCACCTGACGCGCCCTGTAGCGGCGCATTAAAGCGCGCGGGTGTGGTGGTTACG
CGCAGCGTGACCGCTACACTTGCCAGCGCCCTAGCGCCCGCTCCTTTCGCTTTCTTCCCTTCTTTT

TCGCCACGTTTCGCCGGCTTTCCCCGTCAAGCTCTAAATCGGGGGCTCCCTTTAGGGTTCGATTTA
 GTGCTTTACGGCACCTCGACCCCAAAAACTTGATTAGGGTGATGGTTCACGTAGTGGGCCATCG
 CCCTGATAGACGGTTTTTCGCCCTTTGACGTTGGAGTCCACGTTCTTTAATAGTGGACTCTTGTTCC
 AAAC TGGAACAACACTCAACCCTATCTCGGTCTATTCTTTTGATTTATAAGGGATTTTGCCGATTTTC
 GGCTATTGGTTAAAAAATGAGCTGATTTAACAAAAATTTAACGCGAATTTTAACAAAATATTAAC
 GCTTACAATTTCCATTCGCCATT CAGGCTGCGCAACTGTTGGGAAGGGCGATCGGTGCGGGCCTCT
 TCGCTATTACGCCAGCTGGCGAAAGGGGGATGTGCTGCAAGGCGATTAAGTTGGGTAACGCCAGG
 GTTTTCCAGTACGACGTTGTAAAACGACGGCCAGTGCCAAGCTCCCGCGGGGATCGACTCATA
 AAATAGTAACCTTCTAATGCGTATCTATTGACTACCAACCATTAGTGTGGTTGCAGAAGGCGGAAT
 TTTCCCTTCTTCGAATTTAGCTTGCTTTTTTCATTTTTATTTTCCATTTTTTCAGTTTTTGTGTGTCGA
 ATTTAGCCAGTTGCTTCTCCAAGATGAAAAAACCCCTGCGCAGTTTTCTGTGCTGCAAGATCCTAA
 TCGACTTTTCCACCCCCACAAAAGTAAATGTTCTTTTGTTACATTCGCGTGGGTAGCTAGCTCCCC
 GAATCTTCAAAGGACTTAGGGACTGCACTACATCAGAGTGTGTTACCTGGTTTTGCTGCCTGGTTT
 GAAAGAAAAGAGCAGGGAAC TCGCGGGTTCCCGGCGAATAATCATGCGATAGTCCTTTGGCCTTC
 CAAGTCGCATGTAGAGTAGACAACAGACAGGGAGGGCAGGAAGGATCTTCACTGAGATCCTGT
 ATCTTGTGGTAAGTCGGATGAAAGGGGAATCGTATGAGATTGGAGAGGATGCGGAAGAGGTAA
 CGCTTTTGTAACTTGTTAATTATTATGGGGCAGGCGAGAGGGGGAGGAATGTATGTGTGTGAG
 GCGGGCGAGACGGAGCCATCCAGGCCAGGTAGAAATAGAGAAAGCCGAATGTTAGACAATATGG
 CAGCGTAGTAGAGTAGGTAGGTAGGCAAGTACTGCTAGCAAAGAGGAGAAGGGTAAGCTCACTC
 TTCGCATTCCACACCGTTAGTGTGTCAGTTTGAACAAAAACAATCATCATACCAATTGATGGAC
 TGTGGACTGGCTTTTGGAACGGCTTTTCGGACTGCGATTATTCGTGAGGAATCAAGGTAGGAATTT
 GGTCATATTTACGGACAACAGTGGGTGATTCCCATATCGAGTAGGAAAACGAGATCATGGTATCCT
 CAGATATGTTGCGGAAATCTGTTACCCGCAAAGTTCAGGGTGCTCTGGTGGGTTTCGGTTGGTCTT
 TGCTTTGCTTCTCCCTTGTCTTGCATGTTAATAATAGCCTAGCCTGTGAGCCGAAACTTAGGGTAGG
 CTTAGTGTGGAAACGTACATATCTATCACGTTGACTTGGTTTAAACCAGGCGACCTGGTAGCCAGCC
 ATACCCACACACGTTTTTTGTATCTT CAGTATAGTTGTGAAAAGTGTAGCGGAAATTTGTGGTCCGA
 GCAACAGCGTCTTTTTCTAGTAGTGCGGTTCGGTACTTGGTTGACATTGGTATTTGGACTTTGTTGC
 TACACCATTCACTACTTGAAGTCGAGTGTGAAGGGTATGATTTCTAGTGGTGAACACCTTTAGTTA
 CGTAATGTTTTCAATTGCTGTTTTACTT GAGATTTTCGATTGAGAAAAGGTATTTAATAGCTCGAATC
 AATGTGAGAACAGAGAGAAGATGTTCTTCCCTAACTCGAAAGGTATATGAGGCTTGTGTTTCTTAG
 GAGAATTATTATTCTTTTGTATGTTGCGCTTGTAGTTGGAAAAGGTGAAGAGACAAAAGCTGGAA
 TTGTGAGCGGATAACAAGCTCAACACTTGA AATTTAGGAAAGAGCAGAATTTGGCAAAAAAAT
 AAAAAAAAAATAAACACACATACTCATCGAG

Sequence S09. Sequence of the 12937 PB plasmid pkLAC2-B1. The coding sequence of *hasA1* gene is highlighted in green and the coding sequence of *hasB* gene is highlighted in yellow.

AAGCTTATGAGGCAACAAGATGCTCCTAAGCCTACTCCTGCAGCTTCAGATGTAGTGGATTAGCC
 AGAAGGGTTTTAACTATCGCATTTCGCTTTGTTAATATTGGGTTAATGACCTGGGCATATGCCGCCG
 GTGTGCCTTTGGCAAGTGATAGATATGGATTGTTGGCCTTCGGTTTATATGGAGCCTTCTTGTGAGC
 TCACTTGGTTGCTCAGTCATTGTTTCGTTACTTGGAAACACAGGAGAGTGTGCTGCTGCAGCTAGAGG
 TCCATTGGATGCAGCTACAGCTCGTTCAGTGGCTTTGACTATCTCTGCTTATCAGGAAGACCCAGC
 TCACTT GAGACAATGCTTAGCATCTGCAAGAGCATTGTTGTATCCACGTGCAAGGTTACGTGTGTT
 GATGGTTGTAGATGGTAATAGAGCCGAAGATTTGTACATGGTAGATATGTTCCGTGAAGTGTGTTGC
 AGATGAAGATCCAGCCACATACGTCTGGGACGGTAACTATCATCAACCTTGGGAACCAGCTGCAG

CAGGAGCAGTAGGTGCAGGAGCATATAGGGAGGTGGAAGCAGAGGATCCAGGTAGATTAGCTGT
TGAAGCATTAGTAAGAACAAGGAGATGTGTATGCGTGGCCAAAGGTGGGGTGGTAAGAGGGAG
GTAATGTACTGCTTTAAAGCCTTAGGAGATTCAGTTGACTATGTGCAGGTATGCGATTCAGAC
ACCAGATTGGACCCTATGGCATTGTTGGAGTAGTAAGAGTATTGGATGAGGATCCTAGAGTTGGT
GCAGTGGGTGGTGTATGCGTATCTTGAACCCCTTGGATTCATGGGTCTCTTCTTGTCTTCATTGA
GATACTGGGTGGCTTTAATGTAGAACGTGCATGCCAGTCATACTTCCATTGTGTCTCATGCATCTC
TGGACCTTTGGGTTTATACAGAAACAACCTATTGCAACAGTTCCTTAGAGGCATGGTACAACCAAA
AGTTCTTAGGAACCCATTGCACCTTCGGAGATGACAGACACTTGACTAACAGAATGTTATCTATGG
GTTATGCTACTAAGTATACTAGTAGATCAAGGTGCTACTCAGAAACTCCTAGTTCATTCTTGAGATG
GTTATCACAACAGACCAGGTGGTCAAAGAGTTACTTTAGAGAATGGTTGTACAATGCCTTGTGGTG
GCACAGGCATCATGCTTGGATGACATACGAAGCAGTCGTTAGTGGATTGTTCCCTTTCTTTGTCCG
AGCTACTGTATTACGTTTATTCTATGCAGGTAGACCATGGGCTTATTGTGGGTATTATTATGTGTTCA
AGGTGTAGCTTTAGCAAAGGCCGCTTTTGCAGCATGGTTGAGAGGTTGCTTGAGAATGGTTTTATT
GTCATTGTACGCTCCATTATACATGTGTGGATTGTTGCCAGCTAAGTTCCTTAGCATTGGTAACAATG
AATCAATCAGTTGGGGTACTTCAGGAAGAAGAAAATTAGCTGCTAATTACGTTCTTTGTTGCCA
TTGGCTTATGGGCATTGTTGTTATTGGGTGGATTAGTAAGATCTGTAGCACATGAAGCCAGAGCA
GATTGGTCAGGTCCAAGTAGAGCAGCCGAGGCTTATCATTGGCTGCAGGTGCAGGAGCCTACGT
AGGTTACTGGGTGGCTATGTTAACATTATACTGGGTGGTGTAGAAAGATTGTGTAGAAGAAGAAC
TGGAGTTACAGAGTTCAAGTGTAAGGCCTTGAATCGAGAATTTATACTTAGATAAGTATGTACT
TACAGGTATATTTCTATGAGATACTGATGTATACATGCATGATAATATTTAAACGGTTATTAGTGCCG
ATTGTCTTGTGCGATAATGACGTTCCCTATCAAAGCAATACACTTACCACCTATTACATGGGCCAAG
AAAATATTTTCGAACCTGTTTAGAATATTAGCACAGAGTATATGATGTTATCCGTTAGATTATGCATG
ATTCATTCCCTACAACTTTTTCGTAGCATAAGGATTAATTACTTGGATGCCAATAAAAAAAAAAAAC
ATCGAGAAAATTTACAGCATGCTCAGAAACAATTGCAGTGTATCAAAGTAAAAAAAAGATTTTCAC
TACATGTTCTTTTGAAGAAAAGAAAATCATGGAACATTAGATTTACAAAAATTTAACCCCGCTGA
TTAACGATTAGACCGTTAAGCGCACAACAGGTTATTAGTACAGAGAAAGCATTCTGTGGTGTGCC
CCGGACTTTCTTTTGCACATAGGTAAATCGAATACCATCATACTATCTTTTCCAATGACTCCCTAA
AGAAAGACTCTTCTTCGATGTTGTATACGTTGGAGCATAGGGCAAGAATTGTGGCTTGAGATCATC
CTTTTGTGTTTCCGGGTGTACAATATGGACTTCCTCTTTTCTGGCAACCAAAACCCATACATCGGGA
TTCCTATAATACCTTCGTTGGTCTCCCTAACATGTAGGTGGCGGAGGGGAGATATACAATAGAACA
GATACCAGACAAGACATAATGGGCTAAACAAGACTACACCAATTACACTGCCTCATTGATGGTGG
TACATAACGAACTAATACTGTAGCCCTAGACTTGATAGCCATCATCATATCGAAGTTTCACTACCCT
TTTTCCATTTGCCATCTATTGAAGTAATAATAGGCGCATGCAACTTCTTTCTTTTTTTTTCTTTCTCT
CTCCCCGTTGTTGTCTCACCATATCCGCAATGACAAAAAATGATGGAAGACACTAAAGGAAAA
AATTAACGACAAAGACAGCACCAACAGATGTCGTTGTTCCAGAGCTGATGAGGGGTATCTCGAA
GCACACGAAACTTTTTCTTCCTTCATTACGCACACTACTCTCTAATGAGCAACGGTATACGGCC
TTCTTCCAGTTACTTGAATTTGAAATAAAAAAAGTTTGCTGTCTTGCTATCAAGTATAAATAGAC
CTGCAATTATTAATCTTTTGTTCCTCGTCATTGTTCTCGTTCCTTTCTTCCTGTTTCTTTTTCTGCA
CAATATTTCAAGCTATACCAAGCATACAATCAAGCAATTCCAGATCTGCCACCATGCCTCAATCCT
GGGAAGAACTGGCCGCTGATAAGCGCGCCCGCCTCGCAAAAACCATCCCTGATGAATGGAAAGT
CCAGACGCTGCCTGCGGAAGACAGCGTTATTGATTTCCAAAGAAATCGGGCATCCTTTCAGAGG
CCGAACTGAAGATCACAGAGGCTTCCGCTGCGGATCTTGTGTCCAAGCTGGCGGCCGGAGAGTTG
ACCTCGGTGGAAGTTACGCTAGCATTCTGTAAACGGGCAGCAATCGCCAGCAGTTAACAACTG
CGCCACGAGTTCTTCCCTGACGCCGCTCTCGCGCAGGCAAGGGAACCTCGATGAATACTACGCAA

AGCACAAGAGACCCGTTGGTCCACTTCATGGCCTCCCCATCTCTCTCAAAGACCAGCTTCGAGTC
AAGGGCTACGAAACATCAATGGGCTACATCTCATGGCTAAACAAGTACGACGAAGGGGACTCGG
TTCTGACAACCATGCTCCGCAAAGCCGGTGCCGCTTCTACGTCAAGACCTCTGTCCCGCAGACC
CTGATGGTCTGCGAGACAGTCAACAACATCATCGGGCGCACCGTCAACCCACGCAACAAGAACT
GGTCGTGCGGCGGCAGTTCTGGTGGTGAGGGTGCGATCGTTGGGATTCGTGGTGGCGTCATCGGT
GTAGGAACGGACATCGGTGGCTCGATTGAGTGCCGGCCGCGTTCAACTTCTGTACGGTCTAAG
GCCGAGTCATGGGCGGCTGCCGTATGCAAAGATGGCGAACAGCATGGAGGGTCAGGAGACGGTG
CACAGCGTTGTGCGGCCGATTACGCACTCTGTTGAGGACCTCCGCCTCTTACCAAATCCGTCCTC
GGTCAGGAGCCTTGAAATACGACTCCAAGGTCATCCCCATGCCCTGGCGCCAGTCCGAGTCGGA
CATTATTGCCTCCAAGATCAAGAACGGCGGGCTCAATATCGGCTACTACAACCTTCGACGGCAATGT
CCTTCCACACCCTCCTATCCTGCGCGGCGTGGAAACTACCGTCGCCGCACTCGCCAAAGCCGGTC
ACACCGTGACCCCGTGGACGCCATACAAGCACGATTTTCGGCCACGATCTCATCTCCCATATCTACG
CGGCTGACGGCAGCGCCGACGTAATGCGCGACATCAGTGCATCCGGCGAGCCGGCGATTCCAAA
TATCAAAGACCTACTGAACCCGAACATCAAAGCTGTTAACATGAACGAGCTCTGGGACACGCATC
TCCAGAAGTGGAATTACCAGATGGAGTACCTTGAGAAATGGCGGGAGGCTGAAGAAAAGGCCGG
GAAGGAAGTGGACGCCATCATCGCGCCGATTACGCCTACCGCTGCGGTACGGCATGACCAGTTC
GGTACTATGGGTATGCCTCTGTGATCAACCTGCTGGATTTACGAGCGTGGTTGTTCCGGTTACCTT
TGCGGATAAGAACATCGATAAGAAGAATGAGAGTTTCAAGGCGGTTAGTGAGCTTGATGCCCTCG
TGCAGGAAGAGTATGATCCGGAGGCGTATCATGGGGCACCGGTTGCAGTGCAGGTTATCGGACGG
AGACTCAGTGAAGAGAGGACGTTGGCGATTGCAGAGGAAGTGGGGAAGTTGCTGGGAAATGTG
GTGACTCCATAGCCCGGGGGGGGCTCGATCCCTCGCGAGTTGGTTCAGCTGCTGCCTGAGGGTA
CCGGCCGCAAATTAAGCCTTCGAGCGTCCCAAAACCTTCTCAAGCAAGGTTTTAGTATAATGTT
ACATGCGTACACGCGTCTGTACAGAAAAAAGAAAAATTTGAAATATAAATAACGTTCTTAATA
CTAACATAACTATAAAAAAATAAATAGGGACCTAGACTTCAGGTTGTCTAACTCCTTCTTTTCGGT
TAGAGCGGATGTGGGGGGAGGGCGTGAATGTAAGCGTGACATAACTAATTACATGACTCGAGGTC
GACTTACACACGTTGCTTCTTGTGTGGCAAGTCCTGTAAACCGAACTTAGGGATATCAGCAGTTGG
AGTGAATGGTATTCTTTTTGAAGCTACCTTCTTTCCGATGGTTTCCACCTGAAATCCAATGTTTTGCA
ATTCTCCATGCAATTCATCTAAACACGCTTACCATCGAATATGAAAGCAGGCTTAAACATCATCCT
ATGGATTCTATTGAAATCTAATTCCTTGAACATATCCATTACAGTACAAATGACCATAGCGTGTGCA
TTCTCACAGGCTTCGTACAAATCTGTACTTATGTGGACCAATTGAGAAACCCTGTCGTCAGCTGCA
ACACCAGGTTGACTCAAGTCAGTGATGATCTGCTCACGTGGGACCTTTGGATCGTAGATATGTAAC
TTAGCACCTTCATCCATCAAATACTTAGAGATATAGATTGAACTACTCTCTTAGTATCACCTGTATC
CTTCTTGAAGCGAAACCTAACAAATGCGATTTTCTTATCGGTACGGTGTTAAACAAACAATCGAT
TATCCTAGTTGTAACCGTCTCCTTTGATAATCATTATCATATCAATCACTTGTGCCAGTACTTGGCCA
CTTCGTGCAAGTTTAAACACCTCACACAAGTAAACCAAGTTCAAACGTCCTTCTGAAAACATGAA
CCTCCAAATCCCACTGAAGCCTTCAAAAACCTGTTACCAATTCTTTGATCCATAACCAATAGCTCTG
GCAACCTCTTCAACGTCAGCTCCTGTGGCTTACATAAGGCACTAATTGAGTTGATTGAAGAAATT
CTTTGAGCTAAGAATGCGTTGGCTGCTAACTTACTCAACTCAGAAGACCAGGTGTTTGTGGTTATG
ATTTTCTCAGATGGTACCCAGTGTTTCGTATACGTCACACAAAGCTCTAACAGCTTCTGACCTTCAG
GGTTTTGTCACCCACCTATCAAACTCTATCAGGGTCTTCAAATCCTAATGGCTGTACCCTCTGC
CAAAAACCTCTGGGTTACTCAATACCTGCAAGTTCAAATCTGGTTAGTATTTGCATCGAAGATACG
TCTTATTGATTCAGCAGCTCTAACTGGCACAGTAGATTTCTCTGTAACAATCTTGTATCCGTTACTAT
TCTGTACTATTCTTCTAGCGCAAGCCTCAATGTATTTCAAGTCGGCTGCCCTTCCCTTACCCATACC
GTAAGTTTTTGTGGAGTGTGACTGAGATGAACACCAAATCAGCTTCTTGAATTGCACCATCAAT

GTCAGTTGAGTAGAACAATTCTTTCCCCTGCATGACTCTACGACTTCCTTCAAACCTGGTTCGTA
GATAGGCAAAGTGTCACTATTCCAAGCATTGATCCTGGCTTGGTTCACATCCACAACAGTGACCTT
AATGTCAGGGCACATCTGTGCAATGACAGAACAGGTTGGACCACCGACGTAACCGGCACCAATA
CAACAAATCTTCTTGATCTGAAACATTTTTGGATCCACTAGTTCTAGATCCGTCGAAACTAAGTTCT
TGGTGTTTTAAAACTAAAAAAGACTAACTATAAAAAGTAGAATTTAAGAAGTTTAAGAAATAGA
TTTACAGAATTACAATCAATACCTACCGTCTTTATATACTTATTAGTCAAGTAGGGGAATAATTCAG
GGAACCTGGTTTAAACCTTTTTTTTTCAGCTTTTTTCCAATCAGAGAGAGCAGAAGGTAATAGAAGGT
GTAAGAAAATGAGATAGATACATGCGTGGGTCAATTGCCTTGTGTCATCATTTACTCCAGGCAGGT
TGCATCACTCCATTGAGGTTGTGCCCGTTTTTTGCCTGTTTGTGCCCTGTTCTCTGTAGTTGCGCTAA
GAGAATGGACCTATGAACTGATGGTTGGTGAAGAAAACAATATTTTGGTGCTGGGATTCTTTTTTTT
TCTGGATGCCAGCTTAAAAAGCGGGCTCCATTATATTTAGTGGATGCCAGGAATAAACCTGTTTAC
CCAAGCACCATCAGTGTTATATATTCTGTGTAACCCGCCCTATTTTGGCATGTACGGGTTACAGC
AGAATTAAGGCTAATTTTTTACTAAATAAAGTTAGGAAAATCACTACTATTAATTTTACGTA
TTCTTTGAAATGGCAGTATTGATAATGATAAACTCGAGCCTGAGGCTGGACGACCTCGCGGAGTTC
TACCGGCAGTGCAAATCCGTCGGCATCCAGGAAACCAGCAGCGGCTATCCGCGCATCCATGCCCC
CGAACTGCAGGAGTGGGGAGGCACGATGGCCGCTTGGTCGATCTAGATTACGTGGAAGAAAGG
TAGTAAAAGTAGTAGTATAAGTAGTAAAAAGAGTAAAAAGAGAAAACCGGCTACATACTAGAG
AAGCACGTACACAAAACCTCATAGGCACCTTCATCATAACGACAGTTTCTTGATGCATTATAATAGTG
TATTAGATATTTTTCAGAAATATGCATAGAACCTCCTCTTGCCTTTACTTTTTTATACATAGAACATTGG
CAGATTTACTTACACTACTTTGTTTCTACGCCATTCTTTTGTTTTCAACACTTAGACAAGTTGTTGA
GAACCGGACTACTAAAAGCAATGTTCCCACTGAAAATCATGTACCTGCAGCATAATAACCCCT
AATTCTGCATCGATCCAGTATGTTTTTTTTTCTCTACTCATTTTTTACCTGAAGATAGAGCTTCTAAAA
CAAAAAAATCAGTGATTACATGCATATTGTGTGTTCTAGTAACCAAAGGAAAGGAACAGATAGA
TAAAATCCGAGACTGTCAAATTAGGTTTTTTTTCTTTTTTTTTGGCGGGAGTCAGTGGGCCGAAATA
TGTTCTTGGCCTAGAACTTAACTGGTTTTGATCATGCCAATACTTGCCTGAGTGCCCGACTTTTTGC
CCACCCTCTTGCCTTCTGTTCATCCTTCAAACCCACCTGTTTTCCAGCCGTATCTTCGCTCGCATCT
ACACATACTGTGCCATATCTTGTGTGTAGCCGGACGTGACTATGACCAAAAACAAACAAGGAGAA
CTGTTTCGCCGATTTGTAACACTCCTGCATCCATCCAAGTGGGTATGCGCTATGCAATGTTAAGCTAG
GTCAGGTCAGACCAGGTCCAAGGACAGCAACTTGACTGTATGCAACCTTTACCATCTTTGCACAG
AACATACTTGTAGCTAGCTAGTTACTTATGGACCGAAAAGGCACCCACCATGTCTGTCCGGCT
TTAGAGTACGGCCGACAGCCGCTGATTTGCCTTGCCAAGCAGTAGTCACAATGCATCGCATGAGC
ACACGGGCACGGGCACGGGCACAGGAACCATTGGCAAAAATACCAGATACACTATAACCGACGTA
TATCAAGCCCAAGTTTAAAATTCTAAATTTCCGCGGCTACTTTTCAATTCCTATAGTGAGTCGTA
TTAAATTCGTAATCATGTCATAGCTGTTTCTGTGTGAAATTGTTATCCGCTCACAATTCACACAA
CATAAGCCGGAAGCATAAAGTGTAAGCCTGGGGTGCCTAATGAGTGAGCTAACTCACATTA
TTGCGTTGCGCTCACTGCCCCGTTTTCCAGTCGGGAAACCTGTCTGTGCCAGCTGCATTAATGAATCG
GCCAACCGCGCGGGGAGAGGCGTTTTGCGTATTGGGCGCTCTTCCGCTTCTCGCTCACTGACTCG
CTGCGCTCGGTCGTTCCGCTGCGGCGAGCGGTATCAGCTCACTCAAAGGCGGTAATACGGTTATCC
ACAGAATCAGGGGATAACGCAGGAAAGAACATGTGAGCAAAAAGGCCAGCAAAAAGGCCAGGAA
CCGTAAAAGGCCGCGTTGCTGGCGTTTTTCCATAGGCTCCGCCCCCTGACGAGCATCACAAAA
ATCGACGCTCAAGTCAGAGGTGGCGAAACCCGACAGGACTATAAAGATAACCAGGCGTTTCCCCT
GGAAGCTCCCTCGTGCCTCTCCTGTTCCGACCCTGCCGCTTACCGGATACTGTCCGCTTTCTCC
CTTCCGGAAGCGTGGCGTTTTCTCATAGCTCACGCTGTAGGTATCTCAGTTCGGTGTAGGTCGTT
GCTCCAAGCTGGGCTGTGTGCACGAACCCCCGTTACGCCGACCGCTGCGCCTTATCCGGTAAC

TATCGTCTTGAGTCCAACCCGGTAAGACACGACTTATCGCCACTGGCAGCAGCCACTGGTAACAG
GATTAGCAGAGCGAGGTATGTAGGCGGTGCTACAGAGTTCTTGAAGTGGTGGCCTAACTACGGCT
ACACTAGAAGAACAGTATTTGGTATCTGCGCTCTGCTGAAGCCAGTTACCTTCGGAAAAAGAGTT
GGTAGCTCTTGATCCGGCAAACAAACCACCGCTGGTAGCGGTGGTTTTTTTTGTTTGCAAGCAGCA
GATTACGCGCAGAAAAAAGGATCTCAAGAAGATCCTTTGATCTTTTCTACGGGGTCTGACGCTC
AGTGGAACGAAAACTCACGTTAAGGGATTTTGGTCATGAGATTATCAAAAAGGATCTTCACCTAG
ATCCTTTTAAATTA AAAATGAAGTTTTAAATCAATCTAAAGTATATATGAGTAAACTTGGTCTGACA
GTTACCAATGCTTAATCAGTGAGGCACCTATCTCAGCGATCTGTCTATTTTCGTTTCATCCATAGTTGC
CTGACTCCCCGTCGTGTAGATAACTACGATACGGGAGGGCTTACCATCTGGCCCCAGTGCTGCAAT
GATACCGCGAGACCCACGCTCACCGGCTCCAGATTTATCAGCAATAAACCAGCCAGCCGGAAGG
GCCGAGCGCAGAAGTGGTCCTGCAACTTTATCCGCCTCCATCCAGTCTATTAATTGTTGCCGGGAA
GCTAGAGTAAGTAGTTCGCCAGTTAATAGTTTTGCGCAACGTTGTTGCCATTGCTACAGGCATCGTG
GTGTCACGCTCGTCGTTTTGGTATGGCTTCATTCAGCTCCGGTCCCAACGATCAAGGCGAGTTACA
TGATCCCCCATGTTGTGCAAAAAAGCGGTTAGCTCCTTCGGTCCCGATCGTTGTCAGAAGTAAG
TTGGCCGCAGTGTTATCACTCATGGTTATGGCAGCACTGCATAATTCTCTTACTGTCATGCCATCCG
TAAGATGCTTTTCTGTGACTGGTGAGTACTCAACCAAGTCATTCTGAGAATAGTGTATGCGGCGAC
CGAGTTGCTCTTGCCCCGGCGTCAATACGGGATAATACCGCGCCACATAGCAGAACTTTAAAAGTG
CTCATCATTGGAAAACGTTCTTCGGGGCGAAAACCTCTCAAGGATCTTACCGCTGTTGAGATCCAGT
TCGATGTAACCCACTCGTGCAACCAACTGATCTTCAGCATCTTTTACTTTACCAGCGTTTCTGGGT
GAGCAAAAACAGGAAGGCAAAATGCCGCAAAAAAGGGAATAAGGGCGACACGGAAATGTTGA
ATACTCATACTCTTCCTTTTTCAATATTATTGAAGCATTATCAGGGTTATTGTCTCATGAGCGGATA
CATATTTGAATGTATTTAGAAAAATAAACAATAGGGGTTCCGCGCACATTTCCCCGAAAAGTGCC
ACCTGACGCGCCCTGTAGCGGCGCATTAAAGCGCGGCGGGTGTGGTGGTTACGCGCAGCGTGACCG
CTACACTTGCCAGCGCCCTAGCGCCCCTCCTTTTCGCTTTCTTCCCTTCCTTTCTCGCCACGTTCCG
CGGCTTTCCCCGTCAAGCTCTAAATCGGGGGCTCCCTTTAGGGTTCCGATTTAGTGCTTTACGGCAC
CTCGACCCCAAAAACTTGATTAGGGTGATGGTTCACGTAGTGGGCCATCGCCCTGATAGACGGT
TTTTCGCCCTTTGACGTTGGAGTCCACGTTCTTTAATAGTGGACTCTTGTTCAAACTGGAACAAC
ACTCAACCCTATCTCGGTCTATTTCTTTGATTTATAAGGGATTTTGCCGATTTCCGGCCTATTGGTTAA
AAAATGAGCTGATTTAACA AAAAATTTAACGCGAATTTTAACAAAATATTAACGCTTACAATTTCCA
TTCGCCATTAGGCTGCGCAACTGTTGGGAAGGGCGATCGGTGCGGGCCTCTTCGCTATTACGCCA
GCTGGCGAAAGGGGGATGTGCTGCAAGGCGATTAAGTTGGGTAACGCCAGGGTTTTCCAGTCAC
GACGTTGTA AACGACGGCCAGTGCCAAGCTCCCGCGGGGATCGACTCATAAAATAGTAACCTTC
TAATGCGTATCTATTGACTACCAACCATTAGTGTGGTGCAGAAGGCGGAATTTCCCTTCTTCGAA
TTTAGCTTGCTTTTTCATTTTTAITTTCCATTTTCAGTTTTTGTGTTGTGTCGAATTTAGCCAGTTGCT
TCTCCAAGATGAAAAAAACCCCTGCGCAGTTTCTGTGCTGCAAGATCCTAATCGACTTTTCCACCC
CCCACAAAAGTAAATGTTCTTTTGTACATTCGCGTGGGTAGCTAGCTCCCCGAATCTTCAAAGGA
CTTAGGGACTGCACTACATCAGAGTGTGTTACCTGGTTGCTGCCTGGTTTGAAAGAAAAGAGC
AGGGAACTCGCGGTTCCCGGCGAATAATCATGCGATAGTCCTTTGGCCTTCCAAGTCGCATGTAG
AGTAGACAACAGACAGGGAGGGCAGGAAGGATCTTTCACTGAGATCCTGTATCTTGTGGGTAAG
TCGGATGAAAGGGGAATCGTATGAGATTGGAGAGGATGCGGAAGAGGTAACGCCCTTTTGTAACT
TGTTAATTATTATGGGGCAGGCGAGAGGGGGAGGAATGTATGTGTGAGGCGGGCGAGACGGA
GCCATCCAGGCCAGGTAGAAATAGAGAAAGCCGAATGTTAGACAATATGGCAGCGTAGTAGAGT
AGGTAGGTAGGCAAGTACTGCTAGCAAAGAGGAGAAGGGTAAGCTCACTCTTCGATTCCACAC
CGTTAGTGTGTCAGTTTGAACAAAAAACAATCATCATACCAATTGATGGACTGTGGACTGGCTTT

TGGAACGGCTTTTCGGACTGCGATTATTCGTGAGGAATCAAGGTAGGAATTTGGTCATATTTACGG
ACAACAGTGGGTGATTCCCATATCGAGTAGGAAAACGAGATCATGGTATCCTCAGATATGTTGCGG
AAATCTGTTACCGCAAAGTTCAGGGTGCTCTGGTGGGTTTCGGTTGGTCTTTGCTTTGCTTCTCCC
TTGTCTTGCATGTTAATAATAGCCTAGCCTGTGAGCCGAACTTAGGGTAGGCTTAGTGTTGGAAC
GTACATATCTATCACGTTGACTTGGTTAAACCAGGCGACCTGGTAGCCAGCCATACCCACACACGT
TTTTTGATCTTCAGTATAGTTGTGAAAAGTGTAGCGGAAATTTGTGGTCCGAGCAACAGCGTCTTT
TTCTAGTAGTGCGGTTCGGTACTTGGTTGACATTGGTATTTGGACTTTGTTGCTACACCATTCACTAC
TTGAAGTCGAGTGTGAAGGGTATGATTTCTAGTGGTGAACACCTTTAGTTACGTAATGTTTTTCATTG
CTGTTTTACTTGAGATTTGATTGAGAAAAAGGTATTTAATAGCTCGAATCAATGTGAGAACAGAG
AGAAGATGTTCTTCCCTAACTCGAAAGGTATATGAGGCTTGTGTTTCTTAGGAGAATTATTATTCTTT
TGTTATGTTGCGCTTGTAGTTGGAAAAGGTGAAGAGACAAAAGCTGGAATTGTGAGCGGATAACA
AGCTCAACACTTGAATTTAGGAAAGAGCAGAATTTGGCAAAAAAAAAATAAAAAAAAAATAAAC
ACACATACTCATCGAG

Sequence S10. Sequence of the 12863 PB plasmid pkLAC2-B2. The coding sequence of *hasA2* gene is highlighted in green and the coding Sequence of *hasB* gene is highlighted in yellow.

AAGCTTAAAAATGCACTGTGAAAGATTCTTGTGTATCTTGAGGATCATAGGTA
CTACTTTAGTTTTGGATTGTACGGAGCATTCTTGGCTTCTCATTGATTATCCAGAGTTTGTTCGCC
TTCTTAGAACATAGAAAGATGAAGAAATCATTAGAACTCCAATCAAGTTGAATAAGACTGTTGC
CTTGTGATTGCCGCATACCAAGAAGATCCAGACTACTGAGAAAGTGCTTGCAATCAGTCAAGA
GGTAACTATCCAGGTATCAAAGTTGTGATGGTGATTGACGGAAATTCTGAAGATGATTTGTATAT
GATGGACATCTTAGTGAAGTCATGGGTAGAGATAAGTCTGCAACTTACATATGGAAGAATAACT
TCACGAAAAGGGTCCAGGTGAACTGATGAATCTCACAAGAATCATCTCAACATGTA
ACTCAAT
TGGTCTTATCAAACAATCAATTTGCATCATGCAGAAATGGGGTGGTAAGAGAGAAGTTATGTAC
ACTGCTTTCAGAGCATTAGGTCGTTCTGTTGATTATGTACAAGTCTGTGACAGTGATA
CAATGTTGG
ACCCAGCAAGTTCAGTTGAGATGGTGAAAGTTTAGAAGAAGATCCAATGGTGGGTGGTGT
CGGT
GGTGACGTTCAAGTTTGAATAAGTACGACTCTTGGATCTCATTCTTGTATCAGTAAGATACT
GGA
TGGCCTTCAACATTGAAAGAGCTTGTCAATCTACTTCGGATGCGTGCAGTGTATTTCTGGT
CCATT
GGGTATGTATAGAAATTCATTGTTACATGAGTTCGTGGAGGATTGGTACAATCAAGAGTTCAT
GGG
TAACCAATGTTCTTTCGGTGATGATAGACATTTGACAAATAGGGTTTTGTCTTAGGTTATG
CAACC
AAGTACACCGCTAGGTCAAAGTGTTTAACTGAACTCCAATAGAATACTTGAGATGGTTGAAT
CA
ACAAACCAGATGGAGTAAGTCTTACTTCAGAGAATGGTGTACAATGCTATGTGGTTTCACA
AGC
ATCATTGTGGATGACTTATGAGGCCATTACTGGTTTCTTCCATTCTTGTATTGCAACTGT
T
ATCCAGTTGTTCTACCGTGGTAAGATATGGAATATCTTGTATTCTTATTGACTGTCCAAT
TGGTAGG
ATTGATAAAGTCATCATTGCTTCTTGTGTTGAGGGGTAACATTGTTATGGTGTTCATGTCT
TTGTACA
GTGTTTTGTATATGTCAAGTTTGTGTCAGCTAAGATGTTCCGCAATTGCTACAATCAACA
AAGCTGG
TTGGGGAACATCTGGAAGAAAGACTATTGTTGTGAACCTCATTGGATTGATACCTGTGAGT
GTGTG
GTTTACCATCTTATTGGGTGGAGTTATCTTCAATCTACAAGGAATCAAAGAGACCTTTCAGT
GA
ATCTAAACAGACCGTGTGATAGTAGGAACCTTGTGTACGCTTGTATTGGGTAATGTTGTT
AACC
TTGTACGTGGTCTTGTATCAATAAGTGTGGTAGACGTAAGAAGGGTCAACAATATGATAT
GGTCTTG
GATGTTTGAAGGCCCTTGAATCGAGAATTTATACTTAGATAAGTATGTACTTACAGGTAT
ATTTCTATG

AGATACTGATGTATACATGCATGATAATATTTAAACGGTTATTAGTGCCGATTGTCTTGTGCGATAAT
GACGTTCCCTATCAAAGCAATACACTTACCACCTATTACATGGGCCAAGAAAATATTTTCGAACTTG
TTTAGAATATTAGCACAGAGTATATGATGTTATCCGTTAGATTATGCATGATTCATTCCCTACAACCTT
TTCGTAGCATAAGGATTAATTAATTGGATGCCAATAAAAAAAAAAAAAACATCGAGAAAATTCAGC
ATGCTCAGAAACAATTGCAGTGTATCAAAGTAAAAAAAAAGATTTTCACTACATGTTCCTTTTGAAG
AAAGAAAATCATGGAACATTAGATTTACAAAATTTAACACCCTGATTAACGATTAGACCGTTA
AGCGCACAAACAGGTTATTAGTACAGAGAAAGCATTCTGTGGTGTGGCCCCGACTTTCTTTTGCGA
CATAGGTAAATCGAATACCATCATACTATCTTTTCCAATGACTCCCTAAAGAAAGACTCTTCTTCGA
TGTTGTATACGTTGGAGCATAGGGCAAGAATTGTGGCTTGAGATCATCTTTTGTGTTTCCGGGTG
TACAATATGGACTTCCTCTTTTCTGGCAACCAAACCCATACATCGGGATTCCCTATAATACCTTCGTT
GGTCTCCCTAACATGTAGGTGGCGGAGGGGAGATATAACAATAGAACAGATAACCAGACAAGACATA
ATGGGCTAAACAAGACTACACCAATTACACTGCCTCATTGATGGTGGTACATAACGAACTAATACT
GTAGCCCTAGACTTGATAGCCATCATCATATCGAAGTTTCACTACCCTTTTCCATTTGCCATCTATT
GAAGTAATAATAGGCGCATGCAACTTCTTTTCTTTTTTTTTCTTTTCTCTCTCCCCGTTGTTGCTCA
CCATATCCGCAATGACAAAAAATGATGGAAGACACTAAAGGAAAAAATTAACGACAAAGACA
GCACCAACAGATGTCGTTGTTCCAGAGCTGATGAGGGGTATCTCGAAGCACACGAAACTTTTTCC
TTCTTCATTACGCACACTACTCTCTAATGAGCAACGGTATACGGCCTTCCTCCAGTTACTTGAA
TTTGAAATAAAAAAAAAAGTTTGCTGTCTTGTATCAAGTATAAATAGACCTGCAATTATTAATCTTTT
GTTTCTCGTCATTGTTCTCGTTCCCTTTCTCCTTGTTTCTTTTTCTGCACAATATTTCAAGCTATAC
CAAGCATACAATCAAGCAATTCCAGATCTGCCACCATGCCTCAATCCTGGGAAGAACTGGCCGCT
GATAAGCGCGCCCGCTCGCAAAAACCATCCCTGATGAATGGAAAGTCCAGACGCTGCCTGCGG
AAGACAGCGTTATTGATTTCCCAAAGAAATCGGGCATCCTTTCAGAGGCCGAACTGAAGATCACA
GAGGCTTCCGCTGCGGATCTTGTGTCCAAGCTGGCGGCCGGAGAGTTGACCTCGGTGGAAGTTAC
GCTAGCATTCTGTAAACGGGCAGCAATCGCCAGCAGTTAACAACACTGCGCCCACGAGTTCTTCC
CTGACGCCGCTCTCGCGCAGGCAAGGGAACCTCGATGAATACTACGCAAAGCACAAAGAGACCCGT
TGGTCCACTTCATGGCCTCCCCATCTCTCTCAAGACCAGCTTCGAGTCAAGGGCTACGAAACAT
CAATGGGCTACATCTCATGGCTAAACAAGTACGACGAAGGGGACTCGGTTCTGACAACCATGCTC
CGCAAAGCCGGTGGCGTCTTCTACGTCAAGACCTCTGTCCCGCAGACCCTGATGGTCTGCGAGAC
AGTCAACAACATCATCGGGCGCACCGTCAACCCACGCAACAAGAACTGGTCTGCGGCGGCAGT
TCTGGTGGTGAAGGTGCGATCGTTGGGATTCGTGGTGGCGTCATCGGTGTAGGAACGGACATCGG
TGGCTCGATTGAGTGCCGGCCGCTTCAACTTCTGTACGGTCTAAGGCCGAGTCATGGGCGGCT
GCCGTATGCAAAGATGGCGAACAGCATGGAGGGTCAGGAGACGGTGCACAGCGTTGTGCGGCCG
ATTACGCACTCTGTTGAGGACCTCCGCCTTTACCAAATCCGTCTCGGTGAGGACCTTGGA
TACGACTCCAAGGTCATCCCATGCCCTGGCGCCAGTCCGAGTCGGACATTATTGCCTCCAAGATC
AAGAACGGCGGGCTCAATATCGGCTACTACAACCTCGACGGCAATGTCCTTCCACACCCTCCTATC
CTGCGCGGCTGGAAACTACCGTCGCCGCACTCGCCAAAGCCGGTACACCCGTGACCCCGTGGA
CGCCATAAAGCACGATTTCCGCCACGATCTCATCTCCCATATCTACGCGGCTGACGGCAGCGCCG
ACGTAATGCGCGACATCAGTGCATCCGGCGAGCCGGCGATTCCAAATATCAAAGACCTACTGAAC
CCGAACATCAAAGCTGTTAACATGAACGAGCTCTGGGACACGCATCTCCAGAAGTGGAATTACCA
GATGGAGTACCTTGAGAAATGGCGGGAGGCTGAAGAAAAGGCCGGGAAGGAACTGGACGCCAT
CATCGCGCCGATTACGCTACCGCTGCGGTACGGCATGACCAGTTCCGGTACTATGGGTATGCCTC
TGTGATCAACCTGCTGGATTTACGAGCGTGGTTGTTCCGGTTACCTTTGCGGATAAGAATCGA
TAAGAAGAATGAGAGTTTCAAGGCGTTAGTGAGCTTGATGCCCTCGTGCAGGAAGAGTATGATC
CGGAGGCGTATCATGGGGCACCGGTTGCAGTGCAGGTTATCGGACGGAGACTCAGTGAAGAGAG

GACGTTGGCGATTGCAGAGGAAGTGGGGAAGTTGCTGGGAAATGTGGTGACTCCATAGCCCGGG
GGGGGCTCGATCCCCTCGCGAGTTGGTTCAGCTGCTGCCTGAGGGTACCGGCCGCAAATTAAGC
CTTCGAGCGTCCCAAACCTTCTCAAGCAAGGTTTTTCAGTATAATGTTACATGCGTACACGCGTCT
GTACAGAAAAAAGAAAAATTTGAAATATAAATAACGTTCTTAATACTAACATAACTATAAAAA
AATAAATAGGGACCTAGACTTCAGGTTGTCTAACTCCTTCCTTTTCGGTTAGAGCGGATGTGGGG
GAGGGCGTGAATGTAAGCGTGACATAACTAATTACATGACTCGAGGTCGACTTACACACGTTGCTT
CTTGTGTGGCAAGTCTGTAAACCGAACTTAGGGATATCAGCAGTTGGAGTGAATGGTATTCTTTT
TGAAGCTACCTTCTTTCCGATGGTTTCCACCTGAAATCCAATGTTTTGCAATTCTCCATGCAATTCA
TCTAAAACACGTCTACCATCGAATATGAAAGCAGGCTTTAACATCATCCTATGGATTCTATTGAAAT
CTAATTCCTTGAACATATCCCATTCAGTACAAATGACCATAGCGTGTGCATTCTCACAGGCTTCGTA
CAAATCTGTACTTATGTGGACCAATTGAGAAACCCTGTCGTCAGCTGCAACACCAGGTTGACTCA
AGTCAGTGATGATCTGCTCACGTGGGACCTTTGGATCGTAGATATGTAACCTTAGCACCTTCATCCAT
CAAATACTTAGAGATATAGATTGAACTACTCTCTCTAGTATCACCTGTATCCTTCTTGAAAGCGAAA
CCTAACAAATGCGATTTTCTTATCGGTACGGGTGTTAAACAACAATCGATTATCCTAGTTGTAAAC
GTCTCCTTTGATAATCATTATATCAATCACTTGTGCCAGTACTTGGCCACTTCGTGCAAGTTTAAAC
ACCTCACACAAGTAAACCAAGTTCAAACGTCCTTCTGAAAACATGAACCTCCAAATCCCACCTG
AAGCCTTCAAAAACCTGTTACCAATTCTTTGATCCATACCAATAGCTCTGGCAACCTCTTCAACGT
CAGCTCCTGTGGCTTACATAAGGCACTAATTGAGTTGATTGAAGAAATTCTTTGAGCTAAGAATG
CGTTGGCTGCTAACTTACTCAACTCAGAAGACCAGGTGTTTGTGGTTATGATTTTCTCAGATGGTAC
CCAGTGTTCGTATACGTCACACAAAGCTCTAACAGCTTCTGACCTTCAGGGGTTTTCGTCACCACC
TATCAAACTCTATCAGGGTCTTCAAATCCTTAATGGCTGTACCCTCTGCCAAAACTCTGGGTTA
CTCAATACCTGCAAGTTCAAATCTGGTTTAGTATTTGCATCGAAGATACGTCTTATTGATTCAGCAG
CTCTAACTGGCACAGTAGATTTCTCTGTAAACAATCTTGTATCCGTTACTATTCTGTACTATTCTTCTA
GCGCAAGCCTCAATGTATTTCAAGTCGGCTGCCCTTCCCTTACCCATACCGTAAGTTTTTGTGGAG
TGTTGACTGAGATGAACACCAATCAGCTTCTTGAATTGCACCATCAATGTCAGTTGAGTAGAAC
AAATCTTTCCCTGCATGACTCTACGACTTCTTCAAACCTGGTTCGTAGATAGGCCAAAGTGTC
CTATTCCAAGCATTGATCCTGGCTTGGTTCACATCCACAACAGTGACCTTAATGTCAGGGCACATC
TGTGCAATGACAGAACAGGTTGGACCACCGACGTAACCGGCACCAATACAACAATCTTCTTGAT
CTGAAACATTTTTGGATCCACTAGTTCTAGATCCGTCGAAACTAAGTTCTTGGTGTTTTAAACTAA
AAAAAAGACTAACTATAAAAGTAGAATTTAAGAAGTTTAAAGAAATAGATTTACAGAATTACAATC
AATACCTACCGTCTTTATATACTTATTAGTCAAGTAGGGGAATAATTCAGGGAACTGGTTTAAACC
TTTTTTTTCAGCTTTTTCCAAATCAGAGAGAGCAGAAGGTAATAGAAGGTGTAAGAAAATGAGAT
AGATACATGCGTGGGTCAATTGCCTTGTGTCATCATTACTCCAGGCAGGTTGCATCACTCCATTGA
GGTTGTGCCCGTTTTTGCCTGTTTGTGCCCTGTTCTCTGTAGTTGCGCTAAGAGAATGGACCTATG
AACTGATGGTTGGTGAAGAAAACAATATTTTGGTGCTGGGATTCTTTTTTTTTCTGGATGCCAGCTT
AAAAAGCGGGCTCCATTATATTTAGTGGATGCCAGGAATAAACCTGTTACCCAAGCACCATCAG
TGTTATATATTCTGTGTAACCCGCCCTATTTTGGCATGTACGGGTTACAGCAGAATTA AAAAGGCT
AATTTTTGACTAAATAAAGTTAGGAAAATCACTACTATTAATTATTACGTATTCTTTGAAATGGCA
GTATTGATAATGATAAACTCGAGCCTGAGGCTGGACGACCTCGCGGAGTTCTACCGGCAGTGCAA
ATCCGTCGGCATCCAGGAAACCAGCAGCGGCTATCCGCGCATCCATGCCCCCGAACTGCAGGAGT
GGGAGGCACGATGGCCGCTTTGGTGCATCTAGATTACGTGGAAGAAAGGTAGTAAAAGTAGTAG
TATAAGTAGTAAAAAGAGGTAAAAAGAGAAAACCGGCTACATACTAGAGAAGCACGTACACAAA
AACTCATAGGCACCTTCATCATACGACAGTTTCTTGATGCATTATAATAGTGTATTAGATATTTT
AATATGCATAGAACCTCCTCTTGCCTTTACTTTTTATACATAGAACATTGGCAGATTTACTTACACTA

CTTTGTTTCTACGCCATTTCTTTTGTGTTTCAACACTTAGACAAGTTGTTGAGAACCGGACTACTAAA
AAGCAATGTTCCCACTGAAAATCATGTACCTGCAGCATAATAACCCCCTAATTCTGCATCGATCCA
GTATGTTTTTTTTTCTCTACTCATTTTTACCTGAAGATAGAGCTTCTAAAACAAAAAAAATCAGTGA
TTACATGCATATTGTGTGTTCTAGTAACCAAAGGAAAGGAACAGATAGATAAAATTCGAGACTGT
CAAATTAGGTTTTTTTTCTTTTTTTTTGGCGGGAGTCAGTGGGCCGAAATATGTTCTTGGCCTAGAAC
TTAATCTGGTTTGATCATGCCAATACTTGCTGAGTGCCCGACTTTTTGCCCACCCTCTTGCCTTCTG
TCATCCTTCAAACCCACCTGTTTTCCAGCCGTATCTTCGCTCGCATCTACACATACTGTGCCATAT
CTTGTGTGTAGCCGGACGTGACTATGACCAAAAACAAACAAGGAGAACTGTTCCGCCGATTTGTAA
CACTCCTGCATCCATCCAAGTGGGTATGCGCTATGCAATGTTAAGCTAGGTCAGGTCAGACCAGGT
CCAAGGACAGCAACTTGACTGTATGCAACCTTACCATCTTTGCACAGAACATACTTGTAGCTAGC
TAGTTACACTTATGGACCGAAAAGGCACCCACCATGTCTGTCCGGCTTTAGAGTACGGCCGCAG
ACCGCTGATTTGCCTTGCCAAGCAGTAGTCACAATGCATCGCATGAGCACACGGGCACGGGCACG
GGCACAGGAACCATTGGCAAAAATACCAGATACACTATAACCGACGTATATCAAGCCCAAGTTTAA
AATTCTAAATTTCCGCGGCTACTTTTTCAATTCCTATAGTGAGTCGTATTAAATTCGTAATCATGTC
ATAGCTGTTTCTGTGTGAAATTGTTATCCGCTCACAATTCCACACAACATACGAGCCGGAAGCAT
AAAGTGTAAGCCTGGGGTGCCTAATGAGTGAGCTAACTACATTAATTGCGTTGCGCTCACTGCC
CGTTTTCCAGTCGGGAAACCTGTCGTGCCAGCTGCATTAATGAATCGGCCAACGCGCGGGGAGAG
GCGGTTTGCCTATTGGGCGCTCTTCCGCTTCCTCGCTCACTGACTCGCTGCGCTCGGTCGTTCCGGT
GCGGCGAGCGGTATCAGCTCACTCAAAGGCGGTAATACGGTTATCCACAGAATCAGGGGATAACG
CAGGAAAGAACATGTGAGCAAAAGGCCAGCAAAAGGCCAGGAACCGTAAAAAGGCCGCGTTGC
TGGCGTTTTTCCATAGGCTCCGCCCCCTGACGAGCATCACAAAATCGACGCTCAAGTCAGAGG
TGGCGAAACCCGACAGGACTATAAAGATACCAGGCGTTTCCCCCTGGAAGCTCCCTCGTGCGCTC
TCCTGTTCCGACCCCTGCCGCTTACCGGATACCTGTCCGCCTTTCTCCCTTCGGGAAGCGTGGCGCTT
TCTCATAGCTCACGCTGTAGGTATCTCAGTTCGGTGTAGGTCGTTCCGCTCCAAGCTGGGCTGTGTGC
ACGAACCCCCGTTACGCCGACCGCTGCGCCTTATCCGGTAACTATCGTCTTGAGTCCAACCCGG
TAAGACACGACTTATCGCCACTGGCAGCAGCCACTGGTAACAGGATTAGCAGAGCGAGGTATGTA
GGCGGTGCTACAGAGTCTTGAAGTGGTGGCCTAACTACGGCTACACTAGAAGAACAGTATTTGG
TATCTGCGCTCTGCTGAAGCCAGTTACCTTCGGAAAAAGAGTTGGTAGCTCTTGATCCGGCAAAC
AAACCACCGCTGGTAGCGGTGGTTTTTTTTGTTTGAAGCAGCAGATTACGCGCAGAAAAAAGGA
TCTCAAGAAGATCCTTTGATCTTTTCTACGGGGTCTGACGCTCAGTGAACGAAAACCTCACGTAA
GGGATTTGGTTCATGAGATTATCAAAAAGGATCTTACCTAGATCCTTTTAAATTAAAAATGAAGTT
TTAAATCAATCTAAAGTATATATGAGTAACTTGGTCTGACAGTTACCAATGCTTAATCAGTGAGGC
ACCTATCTCAGCGATCTGTCTATTTTCGTTTCATCCATAGTTGCCTGACTCCCCGTGCTGTAGATACTA
CGATACGGGAGGGCTTACCATCTGGCCCCAGTGCTGCAATGATACCGCGAGACCCACGCTCACCG
GCTCCAGATTTATCAGCAATAAACAGCCAGCCGGAAGGGCCGAGCGCAGAAGTGGTCCTGCAA
CTTTATCCGCCTCCATCCAGTCTATTAATTGTTGCCGGGAAGCTAGAGTAAGTAGTTCGCCAGTTAA
TAGTTTTGCGCAACGTTGTTGCCATTGCTACAGGCATCGTGGTGTACGCTCGTCTGTTGGTATGGCT
TCATTCAGCTCCGGTCCCAACGATCAAGGCGAGTTACATGATCCCCATGTTGTGCAAAAAGC
GGTAGCTCCTTCGGTCTCCGATCGTTGTCAGAAGTAAGTTGGCCGAGTGTATCACTCATGGTT
ATGGCAGCACTGCATAATTCTCTTACTGTCATGCCATCCGTAAGATGCTTTTTCTGTGACTGGTGAGT
ACTCAACCAAGTCATTCTGAGAATAGTGTATGCGGCGACCGAGTTGCTCTTGCCCGGCGTCAATAC
GGGATAATACCGCGCCACATAGCAGAACTTTAAAAGTGCTCATCATTGGAAAACGTTCTTCGGGG
CGAAAACCTCTCAAGGATCTTACCGCTGTTGAGATCCAGTTCGATGTAACCCACTCGTGCACCCAA
CTGATCTTCAGCATCTTTTACTTTTACCAGCGTTTCTGGGTGAGCAAAAACAGGAAGGCAAAATG

CCGCAAAAAGGGAATAAGGGCGACACGGAAATGTTGAATACTCATACTCTTCCTTTTCAATATT
ATTGAAGCATTATCAGGGTTATTGTCTCATGAGCGGATACATATTTGAATGTATTTAGAAAAATAA
ACAAATAGGGGTTCCGCGCACATTTCCCCGAAAAGTGCCACCTGACGCGCCCTGTAGCGGCGCAT
TAAGCGCGGCGGGTGTGGTGGTTACGCGCAGCGTGACCGCTACACTTGCCAGCGCCCTAGCGCCC
GCTCCTTCGCTTTCTTCCCTTCCTTTCTCGCCACGTTTCGCCGGCTTTCCCCGTCAAGCTCTAAATCG
GGGGCTCCCTTTAGGGTCCGATTTAGTGCTTTACGGCACCTCGACCCCAAAAAACTTGATTAGGG
TGATGGTTCACGTAGTGGGCCATCGCCCTGATAGACGGTTTTTCGCCCTTGACGTTGGAGTCCAC
GTTCTTTAATAGTGGACTCTTGTTCCAACTGGAACAACACTCAACCCTATCTCGGTCTATTCTTTT
GATTTATAAGGGATTTTGCCGATTTCCGCCTATTGGTTAAAAAATGAGCTGATTTAACAAAAATTTA
ACGCGAATTTTAAACAAAATATTAACGCTTACAATTTCCATTTCGCCATTTCAGGCTGCGCAACTGTTG
GGAAGGGCGATCGGTGCGGGCCCTTCGCTATTACGCCAGCTGGCGAAAGGGGGATGTGCTGCA
AGGCGATTAAGTTGGGTAACGCCAGGGTTTTCCAGTCACGACGTTGTAACGACGCGCCAGTGC
CAAGCTCCCGCGGGGATCGACTCATAAAATAGTAACCTTCTAATGCGTATCTATTGACTACCAACC
ATTAGTGTGGTTGCAGAAGGCGGAATTTCCCTTCTTCGAATTTAGCTTGCTTTTTTCATTTTTTATTTT
CCATTTTTCAGTTTTTGTGGTGTGCGAATTTAGCCAGTTGCTTCTCCAAGATGAAAAAACCCCTGC
GCAGTTTCTGTGCTGCAAGATCCTAATCGACTTTTCCACCCCCACAAAAGTAAATGTTCTTTTGT
ACATTCGCGTGGGTAGCTAGCTCCCCGAATCTTCAAAGGACTTAGGGACTGCACTACATCAGAGT
GTGTTACCTGGTTTGCTGCCTGGTTTTGAAAGAAAAGAGCAGGGAACCTCGCGGGTTCGCGGCGAA
TAATCATGCGATAGTCCTTTGGCCTTCCAAGTCGCATGTAGAGTAGACAACAGACAGGGAGGGCA
GGAAGGATCTTCACTGAGATCCTGTATCTTGTTGGGTAAGTCGGATGAAAGGGGAATCGTATGAG
ATTGGAGAGGATGCGGAAGAGGTAACGCCTTTTGTAACTTGTTTAATTATTATGGGGCAGGCGAG
AGGGGGAGGAATGTATGTGTGAGGCGGGCGAGACGGAGCCATCCAGGCCAGGTAGAAATAGA
GAAAGCCGAATGTTAGACAATATGGCAGCGTAGTAGAGTAGGTAGGTAGGCAAGTACTGCTAGCA
AAGAGGAGAAGGGTAAGCTCACTCTTCGCATTCACACCGTTAGTGTGTGAGTTGAACAAAAA
ACAATCATCATAACCAATTGATGGACTGTGGACTGGCTTTTGGAACGGCTTTTCGGACTGCGATTATT
CGTGAGGAATCAAGGTAGGAATTTGGTCATATTTACGGACAACAGTGGGTGATTCCCATATCGAGT
AGGAAAACGAGATCATGGTATCCTCAGATATGTTGCGGAAATCTGTTACCCGCAAAGTTCAGGGT
GCTCTGGTGGGTTTCGGTTGGTCTTTGCTTTGCTTCTCCCTTGTCTTGCATGTTAATAATAGCCTAGC
CTGTGAGCCGAACTTAGGGTAGGCTTAGTGTGGAACGTACATATCTATCACGTTGACTTGGTTTA
ACCAGGCGACCTGGTAGCCAGCCATACCCACACACGTTTTTTGTATCTTCAGTATAGTTGTGAAAA
GTGTAGCGGAAATTTGTGGTCCGAGCAACAGCGTCTTTTCTAGTAGTGCGGTTCGGTTACTTGGTT
GACATTGGTATTTGGACTTTGTGCTACACCATTCACTACTTGAAGTCGAGTGTGAAGGGTATGATT
TCTAGTGGTGAACACCTTTAGTTACGTAATGTTTTTCATTGCTGTTTTACTTGAGATTCGATTGAGAA
AAAGGTATTTAATAGCTCGAATCAATGTGAGAACAGAGAGAAGATGTTCTTCCCTAACTCGAAAG
GTATATGAGGCTTGTGTTTCTTAGGAGAATTATTATTCTTTTGTATGTTGCGCTTGTAGTTGAAAA
GGTGAAGAGACAAAAGCTGGAATTGTGAGCGGATAACAAGCTCAACACTTGAAATTTAGGAAAG
AGCAGAATTTGGCAAAAAAATAAAAAAATAAACACACATACTCATCGAG

Sequence S11. Sequence of the 12866 PB plasmid pkLAC2-B3. The coding Sequence of *hasA3* gene is highlighted in green and the coding Sequence of *hasB* gene is highlighted in yellow.

AAGCTTAAAAATGCCAGTACAGTTGACTACAGCCTTGAGGGTTGTCGGAACATCATTGTTTCGCTT
GGCTGTTTTAGGTGGTATCTTGGCTGCTTATGCACTGGTTATCAATTCATACTGAAAAGCATI

ACTTAAGTTCCGATTGTATGGAGCTATCTTAGGTTGCACTTGTTGATACAAAGTTTGTCGCTTTC
TTGGAGCATAGAAGAATGCGTCGTGCTGGTCAGGCTTGA AATTGCCTAGTCCTCGTAGAGGTAGT
GTTGCTTGTGATTGCAGCTTATCAGGAGGACCCTGATTACTTGAGAAAATGTTAAGATCTGCTC
AGAGAATTCATTCCCTGATTGAAGGTTGTTATGGTAGTGGATGGAAATCGTCAAGAAGACGCAT
ACATGTTAGATATCTTCATGAAGTATTGGGTGGTACTGAGCAGGACAGGTTTCTTCGTTGGAGGTC
AAACTCCACGAAGCTGGTGAAGGAGAGACCGAAGCCTCATTGCAAGAAGGTATGGATAGAGTC
AGGGACGTGGTCAGAGCATCTACCTTCAGTTGCATTATGCAAAAGTGGGGTGGTAAGAGGGAGGT
GATGTACTGCATTCAAGGCTTTAGGTGATTGAGTGGACTATATCCAAGTGTGTGACTCAGATAC
AGTTTTAGATCCAGCCTGCACTATCGAGATGTTGAGAGTTTTGGAAGAAGATCCACAGGTCGGAG
GTGTGGGTGGAGATGTGCAGATATTGAACAATACGATAGTTGGATCTCTTCTGTCTAGTGTAAG
ATACTGGATGGCTTCAACGTCGAAAGAGCTGTCAATCTTACTTTGGTTGCGTTCAATGATTTCT
GGTCTTTGGGAATGTACAGAAATCTTTGTTGCAACAGTTCTGGAGGACTGGTACCATCAGAAA
TTCTTAGGATCTAAGTGTAGTTTTGGAGATGATAGACATTTGACTAATAGAGTGGTGGAGTTAGGT
ACAGAACCAAGTACACCGCTAGATCAAAGTGCTTACTGAAACTCCAACCAATACTTGAGATG
GTTGAATCAACAACAAGGTGGTCAAAGAGTTACTTCAGAGAATGGTTGTATAACTCTTTATGGTT
TCACAAGCATCACTTATGGATGACTTATGAATCTGTTGTCACCGGTTTCTTCCATTCTTCTAATCG
CTACAGTGATTGAGTTGTTTTACAGAGGTAGAATTTGGAATATTTTATTGTTCTTGTGACTGTCCAA
TTAGTAGGTATCATCAAAGCTACTTACGCTGTTTCTTACGTGGTAACGCCGAAATGATCTTCATGT
CATTGTATAGTTTGTATACATGTCATCATTGTTGCCAGCCAAGATTTTCGCTATCGCCACCATCAAT
AAGTCAGGTTGGGTACTAGTGAAGGAAAACAATTGTTGTCAACTTCATTGGATTGATACCAGT
GAGTATTTGGGTAGCAGTATTGTTAGGTGGTTGGCCTATACTGCTTATTGTCAAGACTTGTCTCAG
AAACTGAATTAGCATTCTTGGTTTCTGGTGCAATCTTATACGGTTGCTATTGGGTTGCTTGTAAATG
TTATACTTGGCAATCATTGCTAGAAGATGCGGAAAGAAACCAGAACAGTACTCTTAGCATTGGC
GAAGTTTAAAGGCCTTGAATCGAGAATTTATACTTAGATAAGTATGTA CTTACAGGTATATTTCTATG
AGATACTGATGTATACATGCATGATAATTTAAACGGTTATTAGTGCCGATTGTCTTGTGCGATAAT
GACGTTCCCTATCAAAGCAATACACTTACCACCTATTACATGGGCCAAGAAAATATTTTCGAACCTG
TTTAGAATATTAGCACAGAGTATATGATGTTATCCGTTAGATTATGCATGATTCATTCTACAACCTT
TTCGTAGCATAAGGATTAATTA CTTGGATGCCAATAAAAAAAAAAAAAACATCGAGAAAATTTACGC
ATGCTCAGAAACAATTGCAGTGTATCAAAGTAAAAAAGATTTTCACTACATGTTCTTTTTGAAG
AAAGAAAATCATGGAACATTAGATTTACAAAAATTTAACACCGCTGATTAACGATTAGACCGTTA
AGCGCACACAGGTTATTAGTACAGAGAAAGCATTCTGTGGTGTGCCCCGGACTTTCTTTTGGCA
CATAGGTAAATCGAATACCATCATACTATCTTTTCCAATGACTCCCTAAAGAAAGACTCTTCTTCGA
TGTTGTATACGTTGGAGCATAGGGCAAGAATTGTGGCTTGAGATCATCCTTTTGTGTTCCGGGTG
TACAATATGGACTTCTCTTTTCTGGCAACCAAACCCATACATCGGGATTCTATAATACCTTCGTT
GGTCTCCCTAACATGTAGGTGGCGGAGGGGAGATATACAATAGAACAGATAACCAGACAAGACATA
ATGGGCTAAACAAGACTACACCAATTACTGCCTCATTGATGGTGGTACATAACGA ACTAATACT
GTAGCCCTAGACTTGATAGCCATCATCATATCGAAGTTTCACTACCCTTTTCCATTGCCATCTATT
GAAGTAATAATAGGCGCATGCAACTTCTTTCTTTTTTTTTCTTTCTCTCTCCCCGTTGTTGTCTCA
CCATATCCGCAATGACAAAAAATGATGGAAGACTAAAGGAAAAAATTAACGACAAAGACA
GCACCAACAGATGTCGTTGTTCCAGAGCTGATGAGGGGTATCTCGAAGCACACGAAACTTTTTCC
TTCCTTCATTACGCACACTACTCTAATGAGCAACGGTATACGGCTTCTTCCAGTTACTTGAA
TTTGAATAAAAAAAAAAGTTTGTCTGCTTGTATCAAGTATAAATAGACCTGCAATTATTAATCTTTT
GTTTCTCGTCATTGTTCTCGTTCCCTTTCTCCTTGTTCCTTTTCTGCACAATATTTCAAGCTATAC
CAAGCATACAATCAAGCAATTCCAGATCTGCCACCATGCCTCAATCCTGGGAAGAACTGGCCGCT

GATAAGCGCGCCCGCCTCGCAAAAACCATCCCTGATGAATGGAAAGTCCAGACGCTGCCTGCGG
AAGACAGCGTTATTGATTTCCCAAAGAAATCGGGCATCCTTTTCAGAGGCCGAACCTGAAGATCACA
GAGGCTTCCGCTGCGGATCTTGTGTCCAAGCTGGCGGCCGGAGAGTTGACCTCGGTGGAAGTTAC
GCTAGCATTCTGTAAACGGGCAGCAATCGCCCAGCAGTTAACAAACTGCGCCCACGAGTTCTTCC
CTGACGCCGCTCTCGCGCAGGCAAGGGAACCTCGATGAATACTACGCAAAGCACAAGAGACCCGT
TGGTCCACTTTCATGGCCTCCCCATCTCTCTCAAAGACCAGCTTCGAGTCAAGGGCTACGAAACAT
CAATGGGCTACATCTCATGGCTAAACAAGTACGACGAAGGGGACTCGGTTCTGACAACCATGCTC
CGCAAAGCCGGTGCCGTCTTCTACGTCAAGACCTCTGTCCCGCAGACCCTGATGGTCTGCGAGAC
AGTCAACAACATCATCGGGCGCACCGTCAACCCACGCAACAAGAAGTGGTCGTGCGGCGGCAGT
TCTGGTGGTGAGGGTGCGATCGTTGGGATTCGTGGTGGCGTCATCGGTGTAGGAACGGACATCGG
TGGCTCGATTTCGAGTGCCGGCCGCGTTCAACTTCTGTACGGTCTAAGGCCGAGTCATGGGCGGCT
GCCGTATGCAAAGATGGCGAACAGCATGGAGGGTCAGGAGACGGTGCACAGCGTTGTCCGGGCCG
ATTACGCACTCTGTTGAGGACCTCCGCCTCTTACCAAATCCGTCTCGGTGAGGACCTTGAAAA
TACGACTCCAAGGTCATCCCATGCCCTGGCGCCAGTCCGAGTCGGACATTATTGCCTCCAAGATC
AAGAACGGCGGGCTCAATATCGGCTACTACAACCTTCGACGGCAATGTCCTTCCACACCCCTCCTATC
CTGCGCGGCGTGGAAACTACCGTCGCCGCACTCGCCAAAGCCGGTACACCGGTGACCCCGTGGAA
CGCCATACAAGCACGATTCGCCCACGATCTCATCTCCCATATCTACGCGGCTGACGGCAGCGCCG
ACGTAATGCGCGACATCAGTGCATCCGGCGAGCCGGCGATTCCAAATATCAAAGACCTACTGAAC
CCGAACATCAAAGCTGTTAACATGAACGAGCTCTGGGACACGCATCTCCAGAAGTGGAAATTACCA
GATGGAGTACCTTGAGAAATGGCGGGAGGCTGAAGAAAAGGCCGGGAAGGAACTGGACGCCAT
CATCGCGCCGATTACGCCTACCGCTGCGGTACGGCATGACCAGTTCCGGTACTATGGGTATGCCTC
TGTGATCAACCTGCTGGATTTACGAGCGTGGTTGTTCCGGTTACCTTTGCGGATAAGAACATCGA
TAAGAAGAATGAGAGTTTCAAGGCGGTTAGTGAGCTTGATGCCCTCGTGCAGGAAGAGTATGATC
CGGAGGCGTATCATGGGGACCGGTTGCAGTGCAGGTTATCGGACGGAGACTCAGTGAAGAGAG
GACGTTGGCGATTGCAGAGGAAGTGGGGAAGTTGCTGGGAAATGTGGTGACTCCATAGCCCGGG
GGGGGCTCGATCCCCTCGCGAGTTGGTTCAGCTGCTGCCTGAGGGTACCGGCCGCAAATTAAGC
CTTCGAGCGTCCCAAACCTTCTCAAGCAAGGTTTTTCAGTATAATGTTACATGCGTACACGCGTCT
GTACAGAAAAAAGAAAAATTTGAAATATAAATAACGTTCTTAATACTAACATAACTATAAAAA
AATAAATAGGGACCTAGACTTCAGGTTGTCTAACTCCTTCTTTTCGGTTAGAGCGGATGTGGGGG
GAGGGCGTGAATGTAAGCGTGACATAACTAATTACATGACTCGAGGTCGACTTACACACGTTGCTT
CTTGTGTGGCAAGTCTGTAAACCGAACTTAGGGATATCAGCAGTTGGAGTGAATGGTATTCTTTT
TGAAGCTACCTTCTTCCGATGGTTTCCACCTGAAATCCAATGTTTTGCAATTCTCCATGCAATTCA
TCTAAAACACGTCTACCATCGAATATGAAAGCAGGCTTTAACATCATCCTATGGATTCTATTGAAAT
CTAATTCCTTGAACATATCCCATTCAGTACAAATGACCATAGCGTGTGCATTCTCACAGGCTTCGTA
CAAATCTGTACTTATGTGGACCAATTGAGAAACCCTGTCGTCAGCTGCAACACCAGGTTGACTCA
AGTCAGTGATGATCTGCTCACGTGGGACCTTTGGATCGTAGATATGTAACCTTAGCACCTTCATCCAT
CAAATACTTAGAGATATAGATTGAACTACTCTCTCTAGTATCACCTGTATCCTTCTTGAAAGCGAAA
CCTAACAATGCGATTTTCTTATCGGTCACGGTGTAAACAACAATCGATTATCCTAGTTGTAAAC
GTCTCCTTTGATAATCATTCAATCAACTTGTGCCAGTACTTGGCCACTTCGTGCAAGTTTAAAC
ACCTCACACAAGTAAACCAAGTTCAAACGTCCTTCTGAAAACATGAACCTCCAAATCCCCTG
AAGCCTTCAAAAACCTGTTACCAATTCTTTGATCCATAACCAATAGCTCTGGCAACCTCTTCAACGT
CAGCTCCTGTGGCTTACATAAGGCACTAATTGAGTTGATTGAAGAAATTCTTTGAGCTAAGAATG
CGTTGGCTGCTAACTTACTCAACTCAGAAGACCAGGTGTTTGTGGTTATGATTTTCTCAGATGGTAC
CCAGTGTTTCGTATACGTACACAAAAGCTCTAACAGCTTCTGACCTTCAGGGGTTTCGTCACCACC

TATCAAAACTCTATCAGGGTCTTCAAATCCTAATGGCTGTACCCTCTGCCAAAACTCTGGGTTA
CTCAATACCTGCAAGTTCAAATCTGGTTTAGTATTTGCATCGAAGATACGTCTTATTGATTCAGCAG
CTCTAACTGGCACAGTAGATTTCTCTGTAAACAATCTTGTATCCGTIACIATTCTGTACTATTCTTCTA
GCGCAAGCCTCAATGTATTTCAAGTCGGCTGCCCTTCCCTTACCCATAACCGTAAGTTTTTGTGGAG
TGTTGACTGAGATGAACACCAAATCAGCTTCTTGAATTGCACCATCAATGTCAGTTGAGTAGAAC
AAATTCCTTCCCCTGCATGACTCTACGACTTCTTCAAACCTGGTTCGTAGATAGGCCAAAGTGCA
CTATTCCAAGCATTGATCCTGGCTTGGTTCACATCCACAACAGTGACCTTAATGTCAGGGCACATC
TGTGCAATGACAGAACAGGTTGGACCACCGACGTAACCGGCACCAATAACAACAATCTTCTTGAT
CTGAAACATTTTTGGATCCACTAGTTCTAGATCCGTCGAAACTAAGTTCTTGGTGTTTTAAACTAA
AAAAAAGACTAACTATAAAAAGTAGAATTTAAGAAGTTTAAGAAATAGATTTACAGAATTACAATC
AATACCTACCGTCTTATATACTIATTAGTCAAGTAGGGGAATAATTTACAGGGAACCTGGTTTAAACC
TTTTTTTTCAGCTTTTTCCAAATCAGAGAGAGCAGAAGGTAATAGAAGGTGTAAGAAAATGAGAT
AGATACATGCGTGGGTCAATTGCCTTGTGTCAATTTACTCCAGGCAGGTTGCATCACTCCATTGA
GGTTGTGCCCGTTTTTGCCTGTTTGTGCCCTGTTCTCTGTAGTTGCGCTAAGAGAATGGACCTATG
AACTGATGGTTGGTGAAGAAAACAATATTTTGGTGCTGGGATTCTTTTTTTTTCTGGATGCCAGCTT
AAAAAGCGGGCTCCATTATATTTAGTGGATGCCAGGAATAAACCTGTTACCCAAGCACCATCAG
TGTTATATATTCTGTGTAACCCGCCCCCTATTTGGCATGTACGGGTTACAGCAGAATTAAGGCT
AATTTTTTGACTAAATAAAGTTAGGAAAATCACTACTATTAATTATTACGTATTCTTTGAAATGGCA
GTATTGATAATGATAAACTCGAGCCTGAGGCTGGACGACCTCGCGGAGTTCTACCGGCAGTGCAA
ATCCGTCGGCATCCAGGAAACCAGCAGCGGCTATCCGCGCATCCATGCCCCCGAACTGCAGGAGT
GGGAGGCACGATGGCCGCTTTGGTCGATCTAGATTACGTGGAAGAAAGGTAGTAAAAGTAGTAG
TATAAGTAGTAAAAGAGGTAAAAGAGAAAACCGGCTACATACTAGAGAAGCAGTACACAAA
AACTCATAGGCACCTTCATCATAACGACAGTTTCTTGATGCATTATAATAGTGTATTAGATATTTT
AATATGCATAGAACCTCCTCTTGCCTTTACTTTTTATACATAGAACATTGGCAGATTTACTTACACTA
CTTTGTTTCTACGCCATTTCTTTTGTTTTCAACACTTAGACAAGTTGTTGAGAACCGGACTACTAAA
AAGCAATGTTCCCACTGAAAATCATGTACCTGCAGCATAATAACCCCTAATTCTGCATCGATCCA
GTATGTTTTTTTTCTCTACTCATTTTTACCTGAAGATAGAGCTTCTAAAACAAAAAAATCAGTGA
TTACATGCATATTGTGTGTTCTAGTAACCAAAGGAAAGGAACAGATAGATAAAATCCGAGACTGT
CAAATTAGGTTTTTTTTCTTTTTTTTTGGCGGGAGTCAGTGGGCCGAAATATGTTCTTGGCCTAGAAC
TTAATCTGGTTTGATCATGCCAATACTTGCTGAGTGCCCGACTTTTTGCCACCCTCTTGCCTTCTG
TCATCCTTCAAACCCACCTGTTTTCCAGCCGTATCTTCGCTCGCATCTACACATACTGTGCCATAT
CTTGTGTGTAGCCGACGTGACTATGACCAAAAACAACAAGGAGAACTGTTCCGCCGATTTGTAA
CACTCCTGCATCCATCCAAGTGGGTATGCGCTATGCAATGTTAAGCTAGGTCAGGTCAGACCAGGT
CCAAGGACAGCAACTTGACTGTATGCAACCTTTACCATCTTTGCACAGAACATACTTGTAGCTAGC
TAGTTACACTTATGGACCGAAAAGGCACCCACCATGTCTGTCCGGCTTTAGAGTACGGCCGACG
ACCGCTGATTTGCCTTGCCAAGCAGTAGTCACAATGCATCGCATGAGCACACGGGCACGGGCACG
GGCACAGGAACCATTGGCAAAAATACCAGATACACTATAACCGACGTATATCAAGCCCAAGTTTAA
AATTCCTAAATTTCCGCGCTACTTTTTCAATCCCTATAAGTGAGTCGTATTAATTCGTAATCATGTC
ATAGCTGTTTCTGTGTGAAATTGTTATCCGCTCACAATTCCACACAACATACGAGCCGGAAGCAT
AAAGTGTAAGCCTGGGGTGCCTAATGAGTGAGCTAACTCACATTAATTGCGTTGCGCTCACTGCC
CGCTTCCAGTCGGGAAACCTGTCGTGCCAGCTGCATTAATGAATCGCCAACGCGCGGGGAGAG
GCGGTTTGCATTTGGGCGCTCTCCGCTTCCGCTCACTGACTCGCTGCGCTCGGTCGTTCCGGCT
GCGGCGAGCGGTATCAGCTCACTCAAAGGCGGTAATACGGTTATCCACAGAATCAGGGGATAACG
CAGGAAAGAACATGTGAGCAAAAGGCCAGCAAAAGGCCAGGAACCGTAAAAAGGCCGCGTTGC

TGGCGTTTTTCCATAGGCTCCGCCCCCTGACGAGCATCACAAAATCGACGCTCAAGTCAGAGG
TGGCGAAACCCGACAGGACTATAAAGATACCAGGCGTTTCCCCCTGGAAGCTCCCTCGTGCCTC
TCCTGTTCCGACCCTGCCGCTTACCGGATACCTGTCCGCCTTTCTCCCTTCGGGAAGCGTGGCGCTT
TCTCATAGCTCACGCTGTAGGTATCTCAGTTCGGTGTAGGTCGTTTCGCTCCAAGCTGGGCTGTGTGC
ACGAACCCCCCGTTCAGCCCGACCGCTGCGCCTTATCCGGTAACTATCGTCTTGAGTCCAACCCGG
TAAGACACGACTTATCGCCACTGGCAGCAGCCACTGGTAACAGGATTAGCAGAGCGAGGTATGTA
GGCGGTGCTACAGAGTTCCTGAAGTGGTGGCCTAACTACGGCTACACTAGAAGAACAGTATTTGG
TATCTGCGCTCTGCTGAAGCCAGTTACCTTCGGAAAAAGAGTTGGTAGCTCTTGATCCGGCAAAC
AAACCACCGCTGGTAGCGGTGGTTTTTTTTGTTTGCAAGCAGCAGATTACGCGCAGAAAAAAGGA
TCTCAAGAAGATCCTTTGATCTTTTCTACGGGGTCTGACGCTCAGTGAACGAAAACCTCACGTAA
GGGATTTTGGTCATGAGATTATCAAAAAGGATCTTACCTAGATCCTTTTTAAATTA AAAATGAAGTT
TTAAATCAATCTAAAGTATATATGAGTAACTTGGTCTGACAGTTACCAATGCTTAATCAGTGAGGC
ACCTATCTCAGCGATCTGTCTATTTTCGTTTCATCCATAGTTGCCTGACTCCCCGTCGTGTAGATACTA
CGATACGGGAGGGCTTACCATCTGGCCCCAGTGCTGCAATGATACCGCGAGACCCACGCTCACCG
GCTCCAGATTTATCAGCAATAAACCAGCCAGCCGGAAGGGCCGAGCGCAGAAGTGGTCCTGCAA
CTTTATCCGCCTCCATCCAGTCTATTAATTGTTGCCGGGAAGCTAGAGTAAGTAGTTCGCCAGTTAA
TAGTTTTCGCAACGTTGTTGCCATTGCTACAGGCATCGTGGTGTACGCTCGTCGTTTGGTATGGCT
TCATTAGCTCCGGTTCCTAACGATCAAGGCGAGTTACATGATCCCCATGTTGTGCAAAAAAGC
GGTAGCTCCTTCGGTCTCCGATCGTTGTCAGAAGTAAGTTGGCCGAGTGTATCACTCATGGTT
ATGGCAGCACTGCATAATTCTCTTACTGTCATGCCATCCGTAAGATGCTTTTTCTGTGACTGGTGAGT
ACTCAACCAAGTCATTCTGAGAATAGTGTATGCGGCGACCGAGTTGCTCTTGCCCGGCGTCAATAC
GGGATAATACCGCGCCACATAGCAGAACTTTAAAAGTGCTCATCATTGGAAAACGTTCTTCGGGG
CGAAAACCTCTCAAGGATCTTACCGCTGTTGAGATCCAGTTCGATGTAACCCACTCGTGCACCCAA
CTGATCTTCAGCATCTTTTACTTTACCAGCGTTTCTGGGTGAGCAAAAACAGGAAGGCAAAATG
CCGCAAAAAAGGGAATAAGGGCGACACGGAAATGTTGAATACTCATACTCTTCCTTTTTCAATATT
ATTGAAGCATTATCAGGGTTATTGTCTCATGAGCGGATACATATTTGAATGTATTTAGAAAAATAA
ACAAATAGGGGTTCCGCGCACATTTCCCCGAAAAGTGCCACCTGACGCGCCCTGTAGCGGCGCAT
TAAGCGCGGGCGGGTGTGGTGGTTACGCGCAGCGTGACCGCTACACTTGCCAGCGCCCTAGCGCCC
GCTCCTTTCGCTTTCTTCCCTTCTTTCTCGCCACGTTTCGCCGCTTTCCCCGTCAAGCTCTAAATCG
GGGCTCCCTTTAGGGTTCGATTTAGTGCTTTACGGCACCTCGACCCCAAAAAACTTGATTAGGG
TGATGGTTCAGTAGTGGGCCATCGCCCTGATAGACGGTTTTTTCGCCCTTGACGTTGGAGTCCAC
GTTCTTTAATAGTGGACTCTTGTTCCAAACCTGGAACAACACTCAACCCTATCTCGGTCTATTCTTTT
GATTTATAAGGGATTTTGCCGATTTTCGGCCTATTGGTTAAAAAATGAGCTGATTTAACAAAAATTA
ACGCGAATTTTAACAAAATATTAACGCTTACAATTTCCATTTCGCCATTAGGCTGCGCAACTGTTG
GGAAGGGCGATCGGTGCGGGCCTCTTCGCTATTACGCCAGCTGGCGAAAGGGGGATGTGCTGCA
AGGCGATTAAGTTGGGTAACGCCAGGGTTTTCCAGTACGACGTTGTAAAACGACGGCCAGTGC
CAAGCTCCCGCGGGGATCGACTCATAAAATAGTAACCTTCTAATGCGTATCTATTGACTACCAACC
ATTAGTGTGGTTGCAGAAGGCGGAATTTCCCTTCTTCGAATTTAGCTTGCTTTTTTCATTTTTATTTT
CCATTTTTCAGTTTTTGTGTTGTGTCGAATTTAGCCAGTTGCTTCTCCAAGATGAAAAAACCCCTGC
GCAGTTTCTGTGCTGCAAGATCCTAATCGACTTTTCCACCCCCACAAAAGTAAATGTTCTTTTGT
ACATTCGCGTGGGTAGCTAGCTCCCCGAATCTTCAAAGGACTTAGGGACTGCACTACATCAGAGT
GTGTTACCTGGTTTGTGCTGCTGTTTGAAGAAAAGAGCAGGGAACCTCGCGGGTTCGCGGCGAA
TAATCATGCGATAGTCCTTTGGCCTTCCAAGTCGCATGTAGAGTAGACAACAGACAGGGAGGGCA
GGAAGGATCTTCACTGAGATCCTGTATCTTGTGGTAAGTCGGATGAAAGGGGAATCGTATGAG

ATTGGAGAGGATGCGGAAGAGGTAACGCCTTTTGTAACTTGTTTAATTATTATGGGGCAGGCCGAG
 AGGGGGAGGAATGTATGTGTGTGAGGCGGGCGAGACGGAGCCATCCAGGCCAGGTAGAAATAGA
 GAAAGCCGAATGTTAGACAATATGGCAGCGTAGTAGAGTAGGTAGGTAGGCAAGTACTGCTAGCA
 AAGAGGAGAAGGGTAAGCTCACTCTTCGCATTCCACACCGTTAGTGTGTCAGTTTGAACAAAAA
 ACAATCATCATACCAATTGATGGACTGTGGACTGGCTTTTGGAACGGCTTTTCGGACTGCGATTATT
 CGTGAGGAATCAAGGTAGGAATTTGGTCATATTTACGGACAACAGTGGGTGATTCCCATATCGAGT
 AGGAAAACGAGATCATGGTATCCTCAGATATGTTGCGGAAATCTGTTACCCGCAAAGTTCAGGGT
 GCTCTGGTGGGTTTCGGTTGGTCTTTGCTTTGCTTCTCCCTTGTCTTGCATGTTAATAATAGCCTAGC
 CTGTGAGCCGAACTTAGGGTAGGCTTAGTGTGGAACGTACATATCTATCACGTTGACTTGGTTTA
 ACCAGGCGACCTGGTAGCCAGCCATACCCACACACGTTTTTTGTATCTTCAGTATAGTTGTGAAAA
 GTGTAGCGGAAATTTGTGGTCCGAGCAACAGCGTCTTTTCTAGTAGTGCGGTCCGGTACTTGGTT
 GACATTGGTATTTGGACTTTGTTGCTACACCATTCACTACTTGAAGTTCGAGTGTGAAGGGTATGATT
 TCTAGTGGTGAACACCTTTAGTTACGTAATGTTTTATTGCTGTTTTACTTGAGATTTGATTGAGAA
 AAAGGTATTTAATAGCTCGAATCAATGTGAGAACAGAGAGAAGATGTTCTTCCCTAACTCGAAAG
 GTATATGAGGCTTGTGTTTCTTAGGAGAATTATTATTCTTTTGTATGTTGCGCTTGTAGTTGGAAAA
 GGTGAAGAGACAAAAGCTGGAATTGTGAGCGGATAACAAGCTCAACACTTGAAATTTAGGAAAG
 AGCAGAATTTGGCAAAAAAATAAAAAAAAAAATAAACACACATACTCATCGAG

Table S1. Primers used in this study. The restriction enzyme sites are highlighted in blue

Primer Name	Sequence (5'-3')	Enzyme Site	Fragment size
HASB-GPD-F	AAA CCTNAGG GTACCGGCCGCAAATTAAG*	<i>Bsu36I</i>	2454
HASB-GPD-R	AA CCTNAGG CTCGAGTTTATCATTATCAATACTGCC*	<i>Bsu36I</i>	
HASA2-F	CCC AAGCTT AAAAAATGCACTGTGAAAGATTC	<i>HindIII</i>	1681
HASA2-R	AAA AGGCCT TCAAACATCCAAGACCATAT	<i>StuI</i>	
HASA3-F	CCC AAGCTT AAAAAATGCCAGTACAGTTGAC	<i>HindIII</i>	1684
HASA3-R	AAA AGGCCT TTAAACTTCGGCAAATGCTAAA	<i>StuI</i>	
HASB-F	ATGTTTCAGATCAAGAAGATTGTGTTGATTGG	--	1485
HASB-R	TTACACACGTTGCTTCTTGTGTG	--	
HASA1/P-F	AATTGTGAGCGGATAACAAG	--	1755 for hasA1
HASA1/P-R	TAAGTATAAATTCTCGATT	--	2948 for hasAP
Rt-PCR HASAP F	TCCATTCGAGGTGATTGTCACAG	--	129
Rt-PCR HASAP R	GCAGCACTAGCTTGAAACC	--	
Rt-PCR HASA1 F	TTTTGCAGCATGGTTGAGAGG	--	135
Rt-PCR HASA1 R	CCTGAAGTACCCCAACCTGA	--	
Rt-PCR HASA2 F	GCAGAAATGGGGTGGTAAGAGA	--	158

Rt-PCR HASA2 R	CACCCACCATTGGATCTTCTTCTAAA	--	
Rt-PCR HASA3 F	GTTTGGAGGTCAAACCTTCCACG	--	133
Rt-PCR HASA3 R	TCTTACCACCCCACTTTTGCATA	--	
Rt-PCR HASB F	GATGTGAACCAAGCCAGGATC	--	142
Rt-PCR HASB R	CAGCTTCTTGAATTGCACCATCAAT	--	
Rt-PCR ACTINKL F	TTCCTTGCCTCACGCTATC	--	124
Rt-PCR ACTINKL R	CGGACGATTTCTCTTTCAGCG	--	

* N means any base

Figure S12. RNA integrity of the strains used in this study analyzed in 1% agarose gel. In wells A to C RNA from strain GG799; In wells D to F RNA from BAP strain; In wells G to I RNA from BA1 strain; In wells J to L RNA from BA2 strain and in wells M to O RNA from BA3 strain.

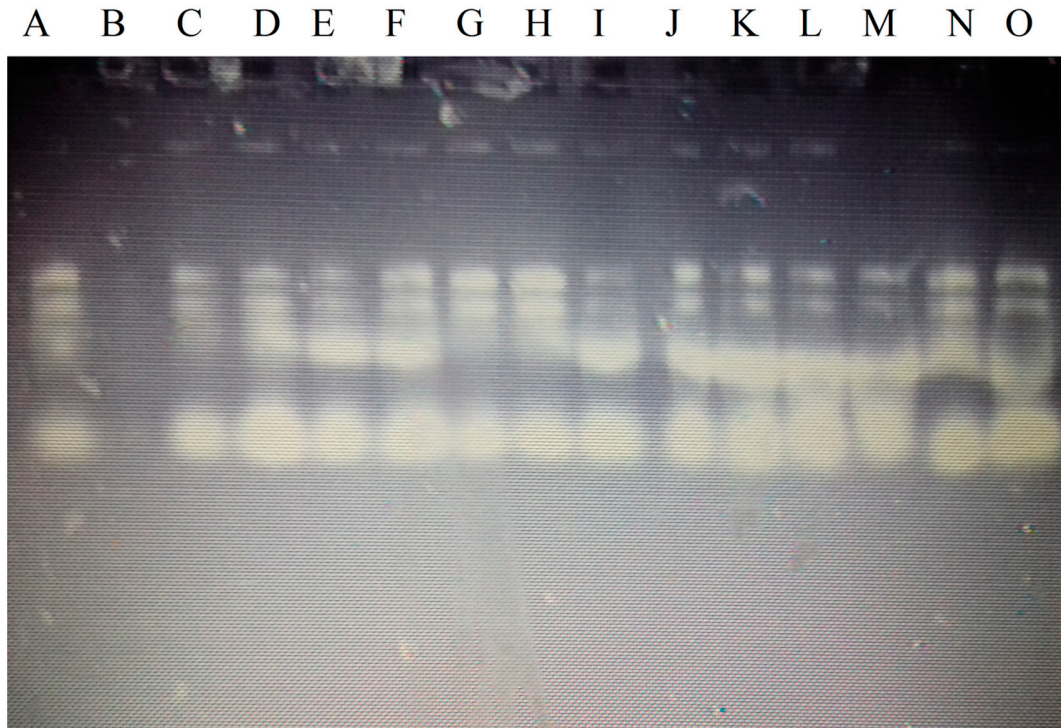


Figure S13. The RNA integrity of the strains used in this study after DNaseI treatment analysed in 1% agarose gel. In wells A to C RNA from strain GG799; In wells D to F RNA from BAP strain; In wells G to I RNA from BA1 strain; In wells J to L RNA from BA2 strain and in wells M to O RNA from BA3 strain.

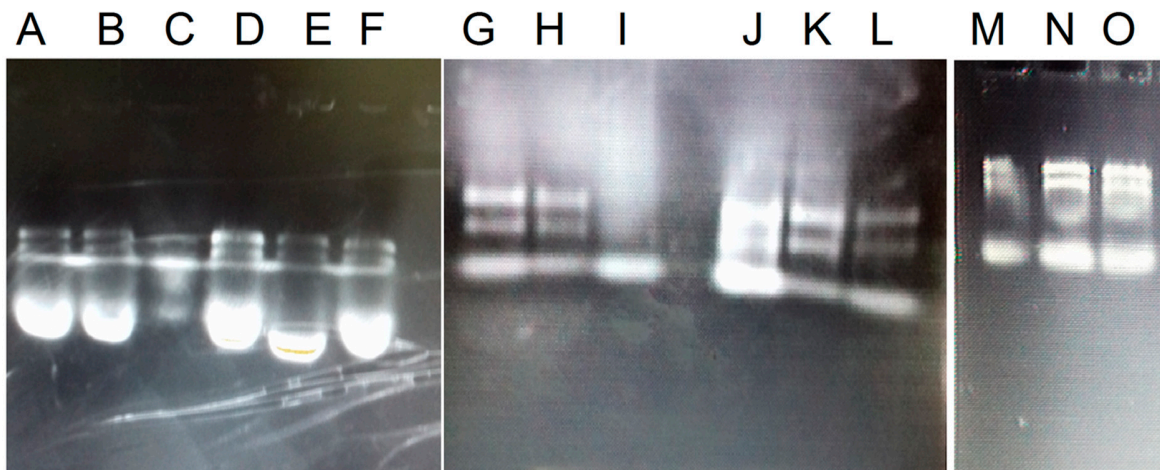


Figure S14. Melt Curve obtained during amplification of hasAP transcripts in RT-qPCR.

Melt Curve

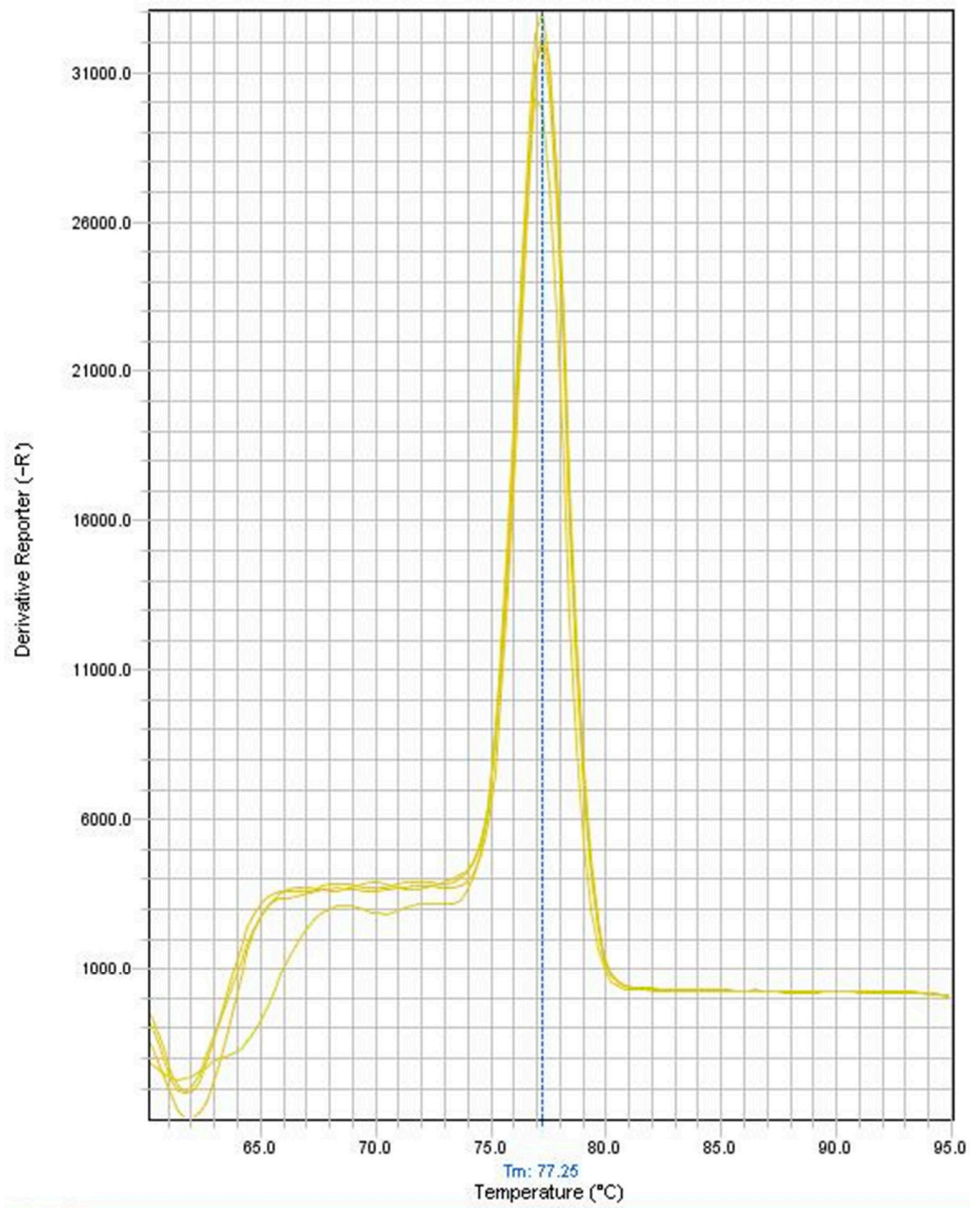


Figure S15. Melt Curve obtained during amplification of hasA1 transcripts in RT-qPCR.

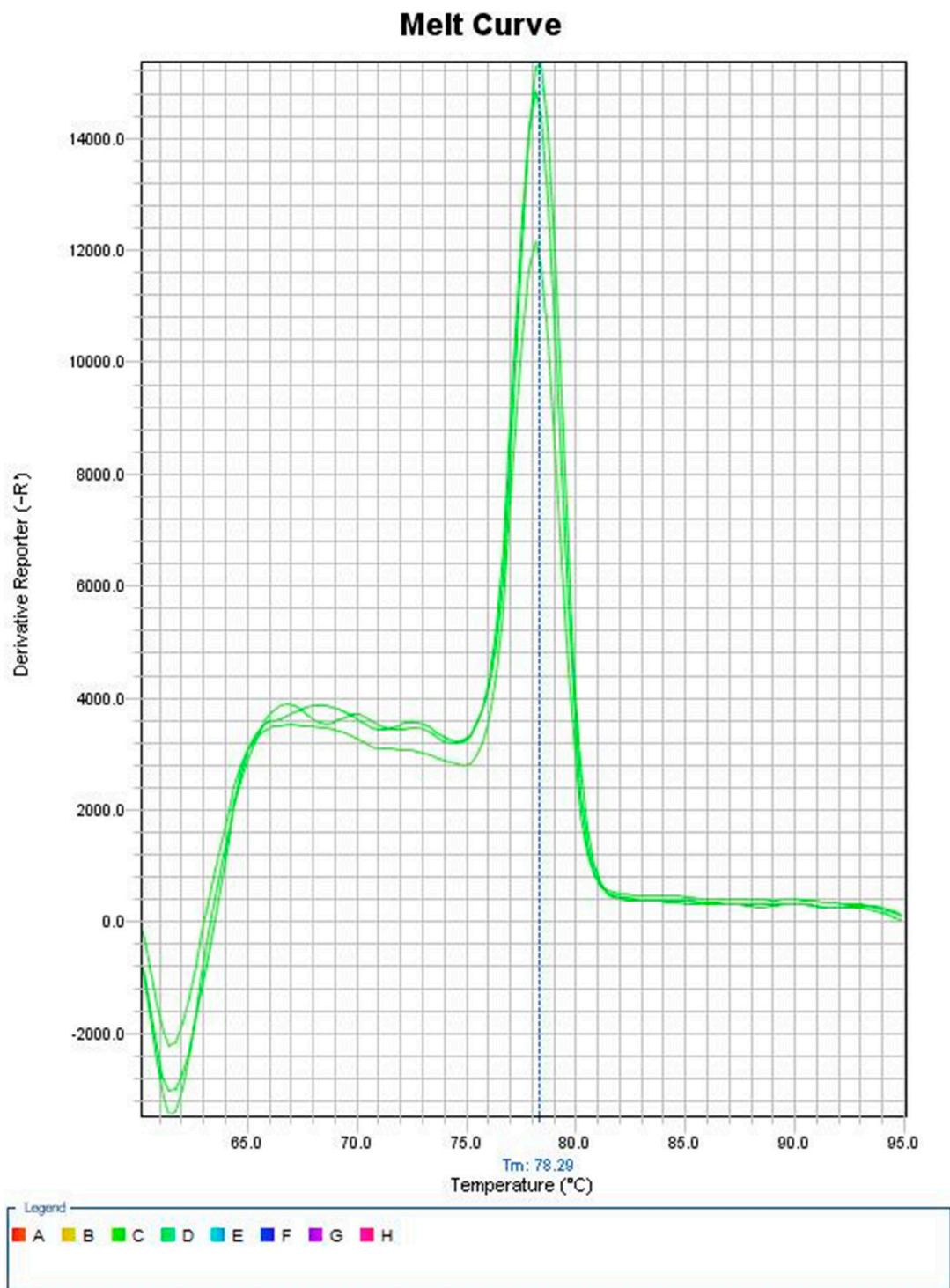


Figure S16. Melt Curve obtained during amplification of hasA3 transcripts in RT-qPCR.

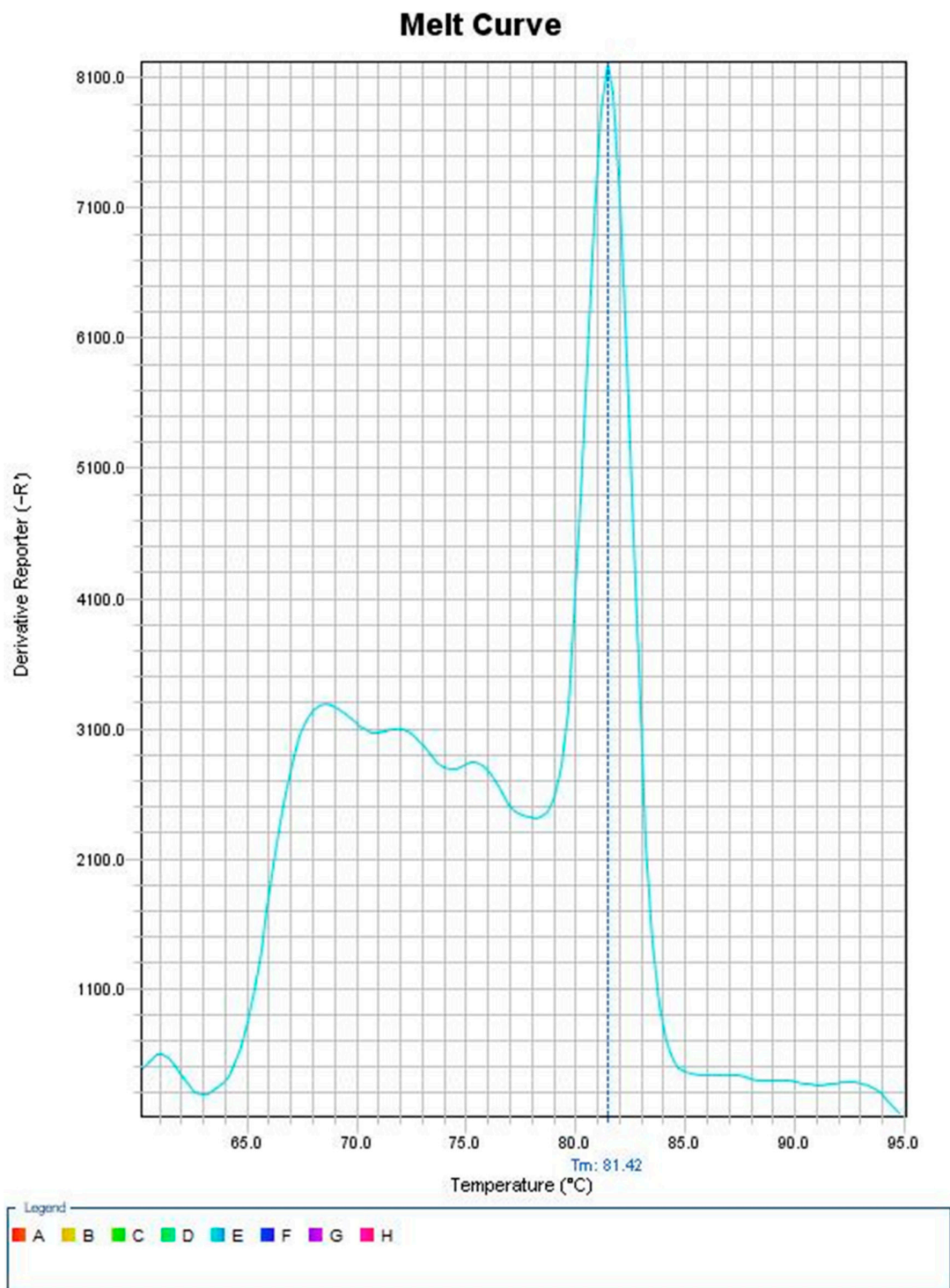


Figure S17. Melt Curve obtained during amplification of hasB transcripts in RT-qPCR.

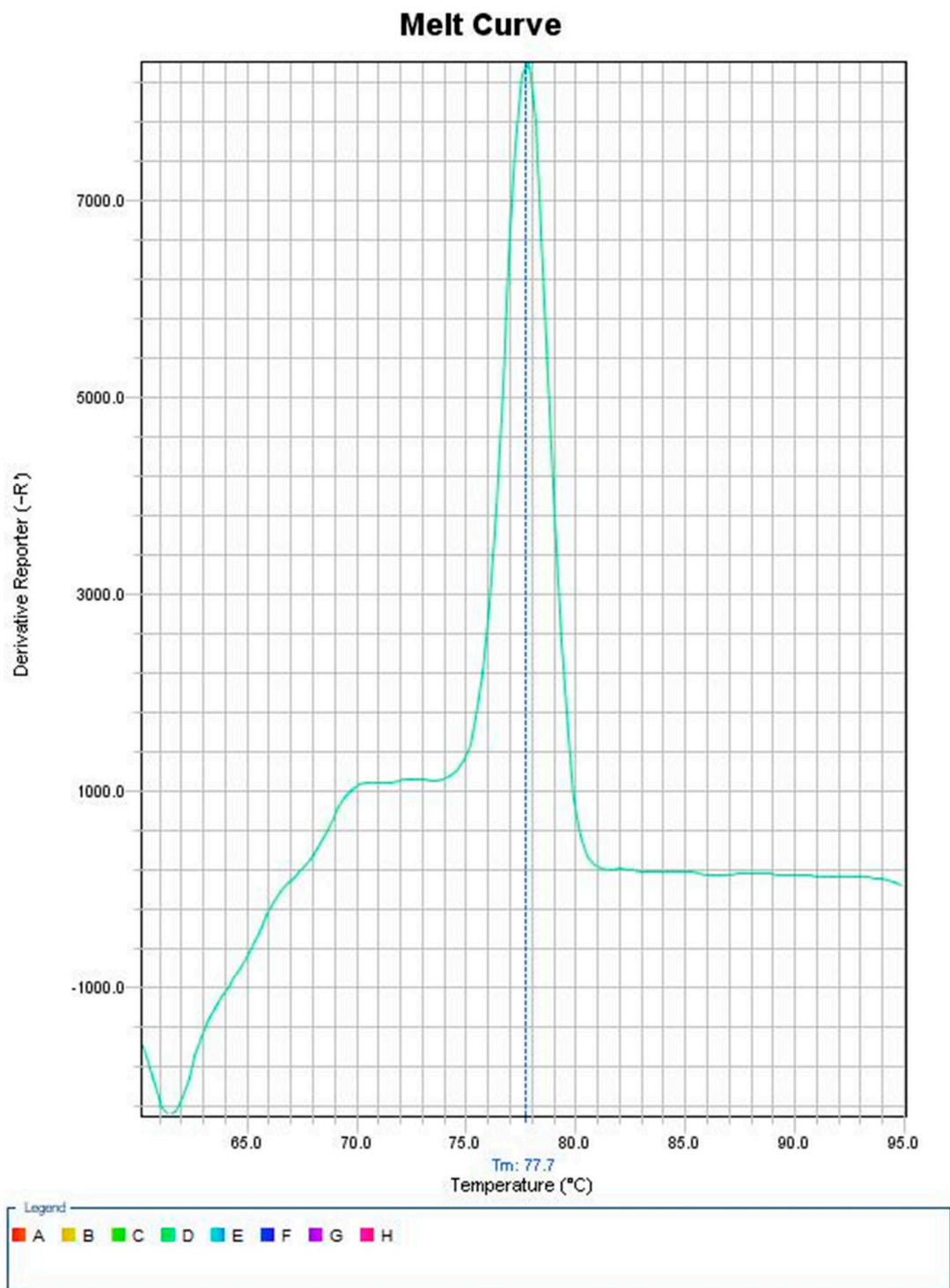


Figure S18. Melt Curve obtained during amplification of Actin transcripts in RT-qPCR.

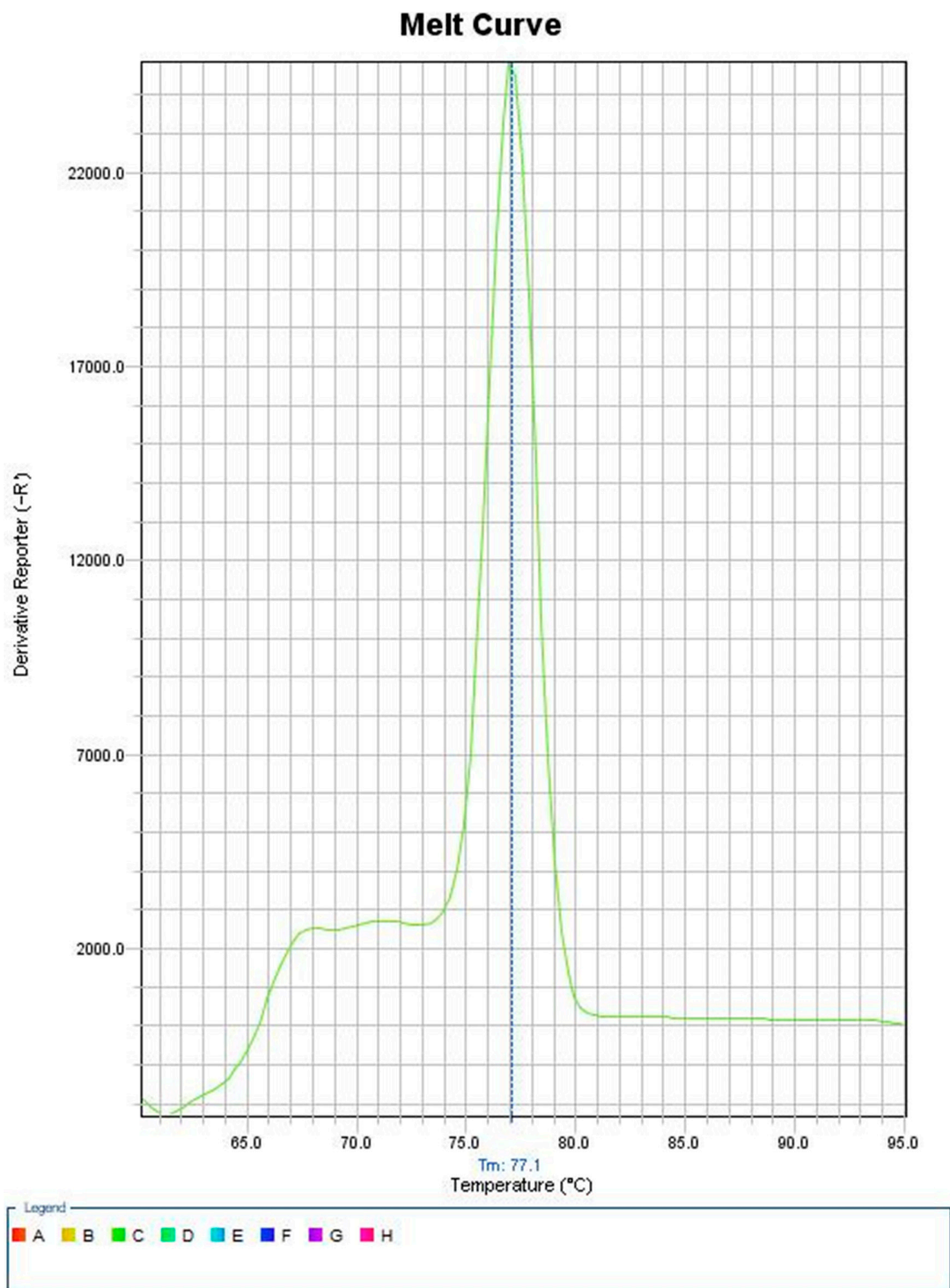


Figure S19. Growth kinetics of the *K. lactis* wild-type strain and strains constructed in the study. Wild type GG799 (diamond); BA1 (triangle); BA2 (straight line); BA3 (asterisks) BAP (square). Results were obtained from mean values of biological triplicate.

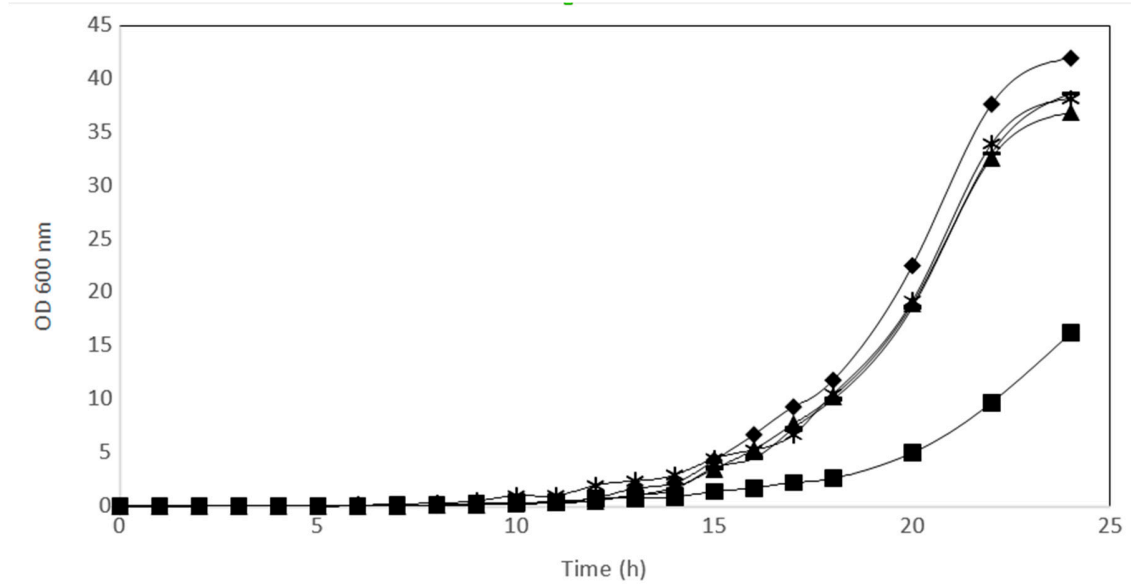


Figure S20. Relative expression of actin, *xlhasB* and *hasA* genes used in the study. The diagonally striped bar represents the transcript level of actin genes, the vertically striped bar represents the transcripts level of *xlhasB* and the gray bar represents the transcripts level of *hasA*. Experimental values obtained from biological triplicates.

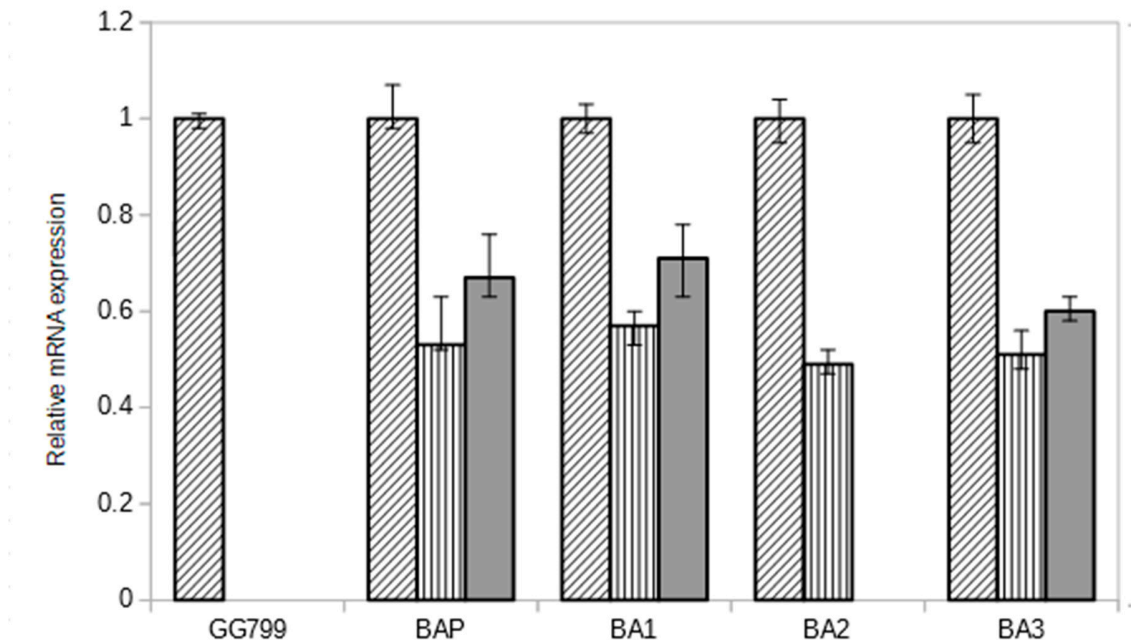


Figure S21. Gene copy number determination of *pmhasA* e *xlhasB* in *K. lactis* BAP strain. Experiment realized in Biological Triplicate.

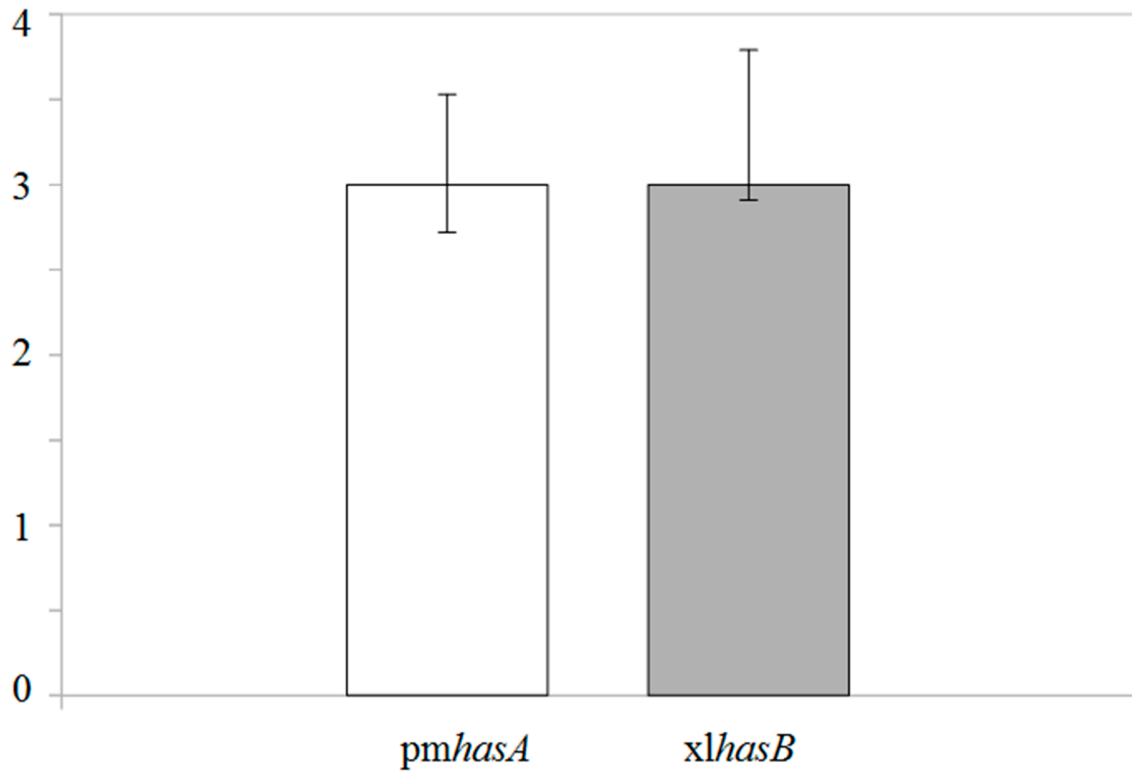


Figure S22. GPC analysis of the standard HA utilized in this study (Sigma). **Legend.** The peak on 32,75 ml represents the Hyaluronic Acid in the sample.

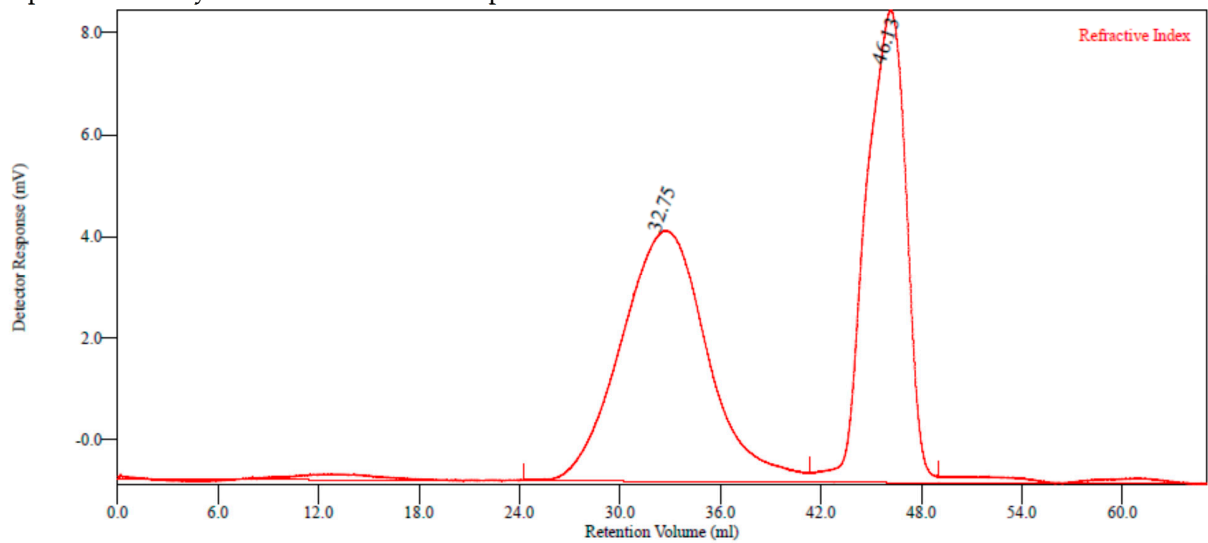


Figure S23. The standard curve for carbazole method constructed in this study and utilized for HA quantification. Experiment realized in Triplicate.

