

# SEQUENCE LISTING

<110> Hyasynth Biologicals Inc.

<120> METHOD AND CELL LINE FOR PRODUCTION OF POLYKETIDES IN YEAST

<130> PAT 85146W-90

<150> US 62/460,526

<151> 2017-02-17

<160> 14

<170> PatentIn version 3.5

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| cccaagaccc aagagaaaaga ggccgtctac taagtaagtt ggctgacgaa ttggaaagcc | 1800 |
| aaattgactt ggtttcttcc attgaagctt tggacaatgg taaaactttg gccttagccc  | 1860 |
| gtggggatgt taccattgca atcaactgtc taagagatgc tgctgcctat gccgacaaag  | 1920 |
| tcaacggtag aacaatcaac accggtgacg gctacatgaa cttcaccacc ttagagccaa  | 1980 |
| tcggtgtctg tgggtcaaatt attccatgga actttccaat aatgatgttg gcttggaaga | 2040 |
| tcgccccagc attggccatg ggtaacgtct gtatcttgaa acccgctgct gtcacacctt  | 2100 |
| taaatgccct atactttgct tctttatgta agaaggttgg tattccagct ggtgtcgtca  | 2160 |
| acatcgttcc aggtcctgggt agaactgttg gtgtgtcttt gaccaacgac ccaagaatca | 2220 |
| gaaagctggc ttttaccggt tctacagaag tcggtaagag tgttgctgtc gactcttctg  | 2280 |

|                                                                     |      |
|---------------------------------------------------------------------|------|
| aatctaactt gaagaaaatc acttttgaac taggtggtaa gtccgcccac ttggtctttg   | 2340 |
| acgatgctaa cattaagaag actttaccaa atctagtaaa cggtattttc aagaacgctg   | 2400 |
| gtcaaatttg ttcctctggc tctagaattt acgttcaaga aggtatttac gacgaactat   | 2460 |
| tggctgcttt caaggcttac ttggaaaccg aaatcaaagt tggtaatcca ttgacaagg    | 2520 |
| ctaacttcca aggtgctatc actaaccgtc aacaattcga cacaattatg aactacatcg   | 2580 |
| atatcggtaa gaaagaaggc gccaaagatct taactgggtg cgaaaaagt ggtgacaagg   | 2640 |
| gttacttcat cagaccaacc gttttctacg atgttaatga agacatgaga attgttaagg   | 2700 |
| aagaaatfff tggaccagtt gtcactgtcg caaagttcaa gacttttagaa gaagggtgcg  | 2760 |
| aaatgggctaa cagctctgaa ttcggctctag gttctatggg tatcgaaaca gaatctttga | 2820 |
| gcacaggttt gaagggtggc aagatgttga aggccgggtac cgtctggatc aacacataca  | 2880 |
| acgattttga ctccagagtt ccattcgggtg gtgttaagca atctgggttac ggtagagaaa | 2940 |
| tgggtgaaga agtctaccat gcatacactg aagtaaaaagc tgtcagaatt aagttgtaaa  | 3000 |
| gacataaaaac tgaaacaaca ccaattaata atagactfff ggactttctc gccagagggt  | 3060 |
| tgggtcaagtc tccaatcaag gttgtcggct tgtctacctt gccagaaatt tacgaaaaga  | 3120 |
| tggaaaaggg tcaaactggt ggtagatacg ttgttgacac ttctaaataa gcgaatttct   | 3180 |
| tatgatttat gatffffatt attaaataag ttataaaaaa aataagtgtg tacaatttt    | 3240 |
| aaagtgactc ttaggtttta aaacgaaaat tcttattctt gagtaactct ttcctgtagg   | 3300 |
| tcaggttgct ttctcaggta tagcatgagg tcgctcttat tgaccacacc tctaccggca   | 3360 |
| tggcttaaat aacatactca tactaaaca ttcttaacaa tcaaagcaac aggcgcgttg    | 3420 |
| gacttttaat tttcgaggac cgccaatcct tacatcacac ccaatcccc acaagtgatc    | 3480 |
| ccccacacac catagcttca aaatgtttct actccttttt tactcttcca gatffffctg   | 3540 |
| gactccgcgc atcgccgtac cacttcaaaa cacccaagca cagcatacta aatttcccct   | 3600 |
| ctttcttcct ctagggtgtc gttaattacc cgtactaaag gtttggaata gaaaaaagag   | 3660 |
| accgcctcgt ttttttttct tcgtcgaaaa aggcaataaa aatttttatc acgtttcttt   | 3720 |
| ttcttgaaaa tttttttttt tgatfffftt ctctttcgat gacctcccat tgatatttaa   | 3780 |

|                                                                    |      |
|--------------------------------------------------------------------|------|
| gttaataaac ggtcttcaat ttctcaagtt tcagtttcat ttttcttggt ctattacaac  | 3840 |
| tttttttact tcttgctcat tagaaagaaa gcatagcaat ctaatctaag ttttaataca  | 3900 |
| tctaccagtc aacagccaac aattaactaa ttaaacaatg tcccaaactc ataagcacgc  | 3960 |
| tattccagct aatattgctg atagatgctt gatcaacca gaacagtacg aaactaagta   | 4020 |
| caagcaatcc atcaacgac cagatacttt ttggggtgaa caaggtaaga ttttggttg    | 4080 |
| gattacccca taccaaaaagg tcaagaatac ttcttttgct ccaggcaacg tttccattaa | 4140 |
| gtggtatgaa gatggtactt tgaacttggc tgctaactgt ttggatagac acttgcaaga  | 4200 |
| aaacggtgat agaaccgcta ttatttggga aggtgatgat acctcccaat ccaaacatat  | 4260 |
| ctcttacaga gaattgcaca gagatgtctg tagattcgct aacactttgt tggatttggg  | 4320 |
| catcaaaaag ggtgatgttg ttgctatcta tatgccaatg gttcctgaag ctgctgttgc  | 4380 |
| tatgttggct tgtgctagaa ttggtgctgt tcattctgtt attttcggtg gtttttcacc  | 4440 |
| agaagctgtt gccggtagaa ttatcgattc ttcattccaga ttggttatca ccgctgatga | 4500 |
| aggtgttaga gctggtagat ctattccatt gaaaaagaac gttgatgacg cttgaagaa   | 4560 |
| cccaaagtgt acttctgttg aacacgtcat cgttttgaag agaactgggt ctgatatcga  | 4620 |
| ttggcaagag ggtagagatt tgtggtggag agatttgatt gaaaaggctt ctccagaaca  | 4680 |
| tcaaccagaa gctatgaacg ctgaagatcc tttgtttatc ttgtacactt ctggttctac  | 4740 |
| tggtaagcca aaagggtgtt tacacactac tgggtggttat ttggtttacg ctgctactac | 4800 |
| tttcaagtac gttttcgatt atcaccagg tgatatctat tgggtgtactg ctgatgttgg  | 4860 |
| ttgggttact ggtcattctt atttgttgta tgggtccattg gcttgtggtg ctactacatt | 4920 |
| gatgtttgaa ggtgttccaa attggccaac tccagctaga atgtgtcaag ttgttgacaa  | 4980 |
| acaccaagtc aacatcttgt atactgctcc aactgctatt agagctttga tggctgaagg  | 5040 |
| tgataaggct attgaaggta ctgatagatc ctccttgaga atcttgggtt ctgttggtga  | 5100 |
| acctattaac cctgaagcct gggaatggta ttggaagaaa attggtaaag aaaagtgtcc  | 5160 |
| agttgttgat acttggtggc aaactgaaac tgggtggtttt atgattactc cattgccagg | 5220 |
| tgctattgaa ttgaaagctg gttctgctac tagaccattt tttggtgttc aaccagcttt  | 5280 |

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|--------------------------------------------------------------------|------|
| ggttgataac gaaggtcatc cacaagaagg tgctactgaa ggtaatttgg ttattactga  | 5340 |
| ttcttggcca ggtcaagcta gaactttgtt tggatgacac gaaagattcg aacagactta  | 5400 |
| cttctctacc ttcaagaaca tgtacttctc tggatgagg gctagaagag atgaagatgg   | 5460 |
| ttactattgg attaccggtg gagttgatga tgtcttgaat gtttctggtc acagattagg  | 5520 |
| tactgccgaa attgaatctg ctttggttgc tcatccaaag attgctgaag ctgcagttgt  | 5580 |
| tggatttcca catgctatta aggggtcaagc tatctacgct tacgttactt tgaatcatgg | 5640 |
| tgaagaacca tctccagaat tatacgctga agttagaaac tgggtcagaa aagaaattgg  | 5700 |
| tccattagct accccagatg ttttacattg gactgattct ttgccaaaga ccagatcagg  | 5760 |
| taagatcatg agaagaatct tgagaaaagat tgctgctggg gatacttcta acttgggtga | 5820 |
| tacttcaaca ttagctgatc cagggtgtgt tgaaaagcct ttggaagaaa aacaagctat  | 5880 |
| tgccatgcca tcctaataat taaatactat tttcaaaatt ctacttaaaa ataacagaag  | 5940 |
| acgggagaca ctagcacaca actttaccag gcaaggtatt tgacgctagc atgtgtccaa  | 6000 |
| ttcagtgtca tttatgattt tttgtagtag gatataaata tatacagcgc tccaaatagt  | 6060 |
| gcggttgccc caaaaacacc acggaacctc atctgttctc gtactttgtt gtgacaaagt  | 6120 |
| agctcactgc cttattatca cattttcatt atgcaacgct tcggaaaata cgatgttgaa  | 6180 |
| aatgcctcta gagatgaaaa acaatcgtaa aagggtcctg cgtaattgaa acatttgatc  | 6240 |
| agtatgcagt ggcacagaaa caaccaggaa tactatagtc ataggcaata caaggatat   | 6300 |
| attggctatg cagaccctc cagaaagtac cgacgtcaag ttagatacac ttaacgaacc   | 6360 |
| tagtgacat ttaattgaga aaaatgtggc tcttcctaag gacatattcc gttcgtactt   | 6420 |
| gagttattgg atctatgaaa tcgctcgcta tacaccagtc atgattttgt cattgcgaag  | 6480 |
| actatactga tatatgaatt taaactagag cggaccaact atcatccgct aattactgac  | 6540 |
| attaccaaatt gagatctgtg aatgggcaag ataaaaaaca aaaattgaaa tgtttgacgt | 6600 |
| tatgtaaaac tattaattcc ttcgctttcg gcggtcacag aatttgcgtg tagctgactc  | 6660 |
| ttgttcaatc aatatcattt gttactttat ttgaaagtct gtattactgc gcctattgtc  | 6720 |
| atccgtacca aagaacgtca aaaagaaaca agataatttt tgtgcttaca ccatttatag  | 6780 |

|                                                                      |      |
|----------------------------------------------------------------------|------|
| atcactgagc ccagaatatc gctggagctc agtgtaagtg gcatgaacac aactctgact    | 6840 |
| gatcgcacat attgccgtta tcataaatac tagttgtact tgtcaatgcg acgaatggca    | 6900 |
| tcatgcctat tattacgttc ctctttttcc gtttcatgtt tccagaatgc tattgaatct    | 6960 |
| aacacttcaa ttataaaaaa gaataaatcc gcaataatth taggctaatt gttgtactgt    | 7020 |
| caagcgaacc taatgggtta aattcagagg aaccttcgac gtagtctgat cgctacttct    | 7080 |
| atatcttatg ttcccagtca atcaaaagtt gatactataa tagctgccat ttataacctgt   | 7140 |
| tagttatggc gatcgthtat cacggcggcc gcggtaccta ataacttcgt atagcataca    | 7200 |
| ttatacgaag ttatattaag ggthctcgac gthttcgaca ctggatggcg gcgttagtat    | 7260 |
| cgaatcgaca gcagtatagc gaccagcatt cacatacgat tgacgcatga tattactthc    | 7320 |
| tgcgcaacta acttcgcatc tgggcagatg atgtcgaggc gaaaaaaat ataaatcacg     | 7380 |
| ctaacatttg attaaaaatag aacaactaca atataaaaaa actatacaaa tgacaagthc   | 7440 |
| ttgaaaacaa gaatctthtt attgtcagta ctgattagaa aaactcatcg agcatcaaat    | 7500 |
| gaaactgcaa thttattcata tcaggattat caataccata thtttgaaaa agccgthtct   | 7560 |
| gtaatgaagg agaaaactca ccgaggcagt tccataggat ggcaagatcc tggtatcggt    | 7620 |
| ctgcgattcc gactcgthca acatcaatac aacctattaa thttccctcg tcaaaaataa    | 7680 |
| ggttatcaag tgagaaatca ccatgagtga cgactgaatc cggtgagaat ggcaaaagct    | 7740 |
| tatgcattthc thttccagact tgthcaacag gccagccatt acgctcgthca tcaaaatcac | 7800 |
| tcgcatcaac caaacgtta thcattcgthg attgcgcctg agcgagacga aatacgcgat    | 7860 |
| cgctgttaaa aggacaatta caaacaggaa tcgaatgcaa ccggcgcagg aacactgcca    | 7920 |
| gcgcatcaac aatathththc cctgaatcag gatattctthc taataacctgg aatgctgtht | 7980 |
| tgccggggat cgcagtggtg agtaaccatg catcatcagg agtacggata aaatgctthg    | 8040 |
| tggtcggaag aggcataaat tccgtcagcc agthtagthc gaccatthca thtgtaacat    | 8100 |
| cattggcaac gthacctthg ccatgththc gaaacaactc tggcgcatcg ggctthccat    | 8160 |
| acaatcgata gattgtcgca cctgattgcc cgacattatc gcgagcccat thatacccat    | 8220 |
| ataaatcagc atccatgthg gaattthaatc gcggcctcga aacgtgagthc thttcctthc  | 8280 |

|                                                                      |      |
|----------------------------------------------------------------------|------|
| ccatggttgt ttatgttcgg atgtgatgtg agaactgtat cctagcaaga ttttaaaagg    | 8340 |
| aagtatatga aagaagaacc tcagtggcaa atcctaacct tttatatattc tctacagggg   | 8400 |
| cgcggttggt ggacaattca acgcgtctgt gaggggagcg tttccctgct cgcaggtctg    | 8460 |
| cagcgaggag ccgtaatttt tgcttcgctc cgtgcggcca tcaaaatgta tggatgcaaa    | 8520 |
| tgattataca tggggatgta tgggctaaat gtacgggcga cagtcacatc atgcccctga    | 8580 |
| gctgcgcacg tcaagactgt caaggagggt attctgggcc tccatgtcgc tggccgggtg    | 8640 |
| acccggcggg gacgaggcaa gctaaacaga tctctagacc taataacttc gtatagcata    | 8700 |
| cattatacga agttatatta agggttgtct taattaaggg tgcccaattc gccctatagt    | 8760 |
| gagtcgtatt acgcgcgctc actggccgtc gttttacaac gtcgtgactg ggaaaaccct    | 8820 |
| ggcgttaccc aacttaatcg ccttgacgca catccccctt tcgccagctg gcgtaatagc    | 8880 |
| gaagaggccc gcaccgatcg cctttcccaa cagttgcgca gcctgaatgg cgaatggcgc    | 8940 |
| gacgcgccct gtagcggcgc attaagcgcg gcgggtgtgg tggttacgcg cagcgtgacc    | 9000 |
| gctacacttg ccagcgccct agcgcccgct cctttcgctt tcttcccttc ctttctcgcc    | 9060 |
| acgttcgccc gctttccccg tcaagctcta aatcgggggc tccctttagg gttccgattt    | 9120 |
| agtgctttac ggcacctcga ccccaaaaaa cttgattagg gtgatggttc acgtagtggg    | 9180 |
| ccatcgccct gatagacggg ttttcgccct ttgacgttgg agtccacgtt ctttaatagt    | 9240 |
| ggactcttgt tccaaactgg aacaacactc aaccctatct cggtctattc ttttgattta    | 9300 |
| taagggattt tgccgatttc ggcctattgg ttaaaaaatg agctgattta acaaaaattt    | 9360 |
| aacgcgaatt ttaacaaaat attaacgttt acaatttcct gatgcggtat tttctcctta    | 9420 |
| cgcactctgt cggtatttca caccgcatag atccgtcgag ttcaagagaa aaaaaaagaa    | 9480 |
| aaagcaaaaa gaaaaaagga aagcgcgcct cgttcagaat gacacgtata gaatgatgca    | 9540 |
| ttaccttgtc atcttcagta tcatactgtt cgtatacata cttactgaca ttcataaggta   | 9600 |
| tacatatata cacatgtata tatatcgat gctgcagctt taaataatcg gtgtcaatgt     | 9660 |
| ctgccccctat gtctgccccct aagaagatcg tcgttttgcc aggtgaccac gttgggtcaag | 9720 |
| aaatcacagc cgaagccatt aaggttctta aagctatttc tgatgttcgt tccaatgtca    | 9780 |

|          |         |             |          |         |            |            |         |          |        |       |       |       |       |       |        |       |        |       |       |       |       |    |     |
|----------|---------|-------------|----------|---------|------------|------------|---------|----------|--------|-------|-------|-------|-------|-------|--------|-------|--------|-------|-------|-------|-------|----|-----|
| agttcgat | ttt     | cgaaaaatcat | ttaattgg | tg      | gtgctgctat | cgatgctaca | ggtgtcc | cac      | 9840   |       |       |       |       |       |        |       |        |       |       |       |       |    |     |
| ttccagat | ga      | ggcgctgg    | aa       | gcctcca | aga        | aggttgat   | gc      | cgttttgt | ta     | 9900  |       |       |       |       |        |       |        |       |       |       |       |    |     |
| gtgg     | tcctaa  | atgggg      | tgcc     | ggtagt  | gtta       | gacctga    | aca     | aggttt   | acta   | 9960  |       |       |       |       |        |       |        |       |       |       |       |    |     |
| aaaatcc  | gta     | aagaactt    | ca       | attgtac | gcc        | aacttaag   | ac      | catgta   | actt   | 10020 |       |       |       |       |        |       |        |       |       |       |       |    |     |
| tgc      | atccgac | tctctttt    | tag      | acttat  | ctcc       | aatcaag    | cca     | caattt   | gcta   | 10080 |       |       |       |       |        |       |        |       |       |       |       |    |     |
| aagg     | tactga  | cttcgtt     | gtt      | gtcag   | aga        | aat        | gga     | agaa     | gac    | 10140 |       |       |       |       |        |       |        |       |       |       |       |    |     |
| tggtgat  | ggt     | gtc         | gctt     | ggg     | atagt      | gaaca      | atacacc | gtt      | ccaga  | agtgc | 10200 |       |       |       |        |       |        |       |       |       |       |    |     |
| aaagaat  | cac     | aagaat      | ggcc     | gcttt   | cat        | gg         | ccctaca | aca      | tgagcc | acca  | 10260 |       |       |       |        |       |        |       |       |       |       |    |     |
| ttgcctat | ttt     | gg          | tcctt    | gga     | taaag      | cta        | at      | gtttt    | ggc    | ct    | 10320 |       |       |       |        |       |        |       |       |       |       |    |     |
| cttcaag  | att     | atggag      | aaaa     | actgt   | ggagg      | aaaccat    | caa     | gaacga   | attc   | cctac | attga | 10380 |       |       |        |       |        |       |       |       |       |    |     |
| agg      | ttcaaca | tcaatt      | gatt     | gattct  | gccg       | ccatgat    | cct     | agtta    | aga    | ac    | cca   | acc   | 10440 |       |        |       |        |       |       |       |       |    |     |
| cca      | acc     | cacc        | taaat    | ggtat   | tataat     | cacc       | agcaac  | atgt     | ttggt  | gat   | at    | catct | ccgat | gaag  | cctccg | 10500 |        |       |       |       |       |    |     |
| ttatccc  | agg     | ttcctt      | gggt     | ttgtt   | gccat      | ctgcgt     | cctt    | ggcct    | cttt   | g     | ccag  | aca   | aga   | 10560 |        |       |        |       |       |       |       |    |     |
| acacc    | gcatt   | tggttt      | gtac     | gaacc   | atgcc      | acggtt     | ctgc    | tccag    | attt   | g     | ccaa  | aga   | ata   | 10620 |        |       |        |       |       |       |       |    |     |
| agg      | ttg     | accc        | tatc     | gccact  | atctt      | gtctg      | ctgca   | atgat    | gttg   | aaatt | g     | tcatt | ga    | act   | 10680  |       |        |       |       |       |       |    |     |
| tg       | cctga   | aga         | agg      | taagg   | cc         | attga      | agatg   | cagt     | taaaa  | aa    | gg    | tttt  | ggat  | gc    | agg    | tatca | 10740  |       |       |       |       |    |     |
| ga       | actg    | gtga        | tttag    | gtg     | gt         | tcca       | acag    | ta       | ccacc  | ga    | agt   | cggt  | gat   | g     | ctgcc  | gaag  | 10800  |       |       |       |       |    |     |
| aag      | ta      | aga         | aatc     | ctt     | gct        | taact      | ttt     | gcc      | ttc    | gttt  | atc   | ttg   | cct   | g     | ctc    | at    | tttttt | tagt  | 10860 |       |       |    |     |
| atatt    | ctt     | cg          | aaga     | aat     | cac        | attact     | ttt     | at       | ataat  | gt    | tata  | attc  | att   | atg   | tgata  | at    | gcc    | 10920 |       |       |       |    |     |
| aat      | cg      | taag        | aaaa     | aaaa    | aaag       | ag         | tc      | atcc     | gc     | taggg | gaaa  | aaaa  | aa    | atga  | aa     | at    | catt   | ac    | 10980 |       |       |    |     |
| cg       | agg     | cata        | aa       | aa      | atatag     | ag         | tg      | tact     | tag    | agg   | agg   | ccaa  | gag   | ta    | ataga  | aaa   | ag     | aaa   | aat   | 11040 |       |    |     |
| tg       | cggg    | aaag        | gact     | gt      | gtta       | tgact      | ttcc    | ct       | gact   | aat   | gcc   | gtgt  | tcaa  | ac    | gata   | cc    | tgg    | c     | 11100 |       |       |    |     |
| ag       | t       | gact        | cct      | agc     | gct        | cacc       | aag     | ct       | ctta   | aa    | aac   | ggg   | aat   | tat   | ggt    | gc    | ac     | tct   | cagt  | taca  | 11160 |    |     |
| at       | ct      | gct         | ctg      | at      | gcc        | gcata      | gtta    | ag       | ccag   | cccc  | gac   | acc   | cg    | cca   | acac   | g     | cg     | ct    | gac   | gcg   | 11220 |    |     |
| cc       | ct      | gac         | ggg      | ctt     | gt         | ctg        | ct      | ccc      | gg     | cat   | cc    | gctt  | ac    | ag    | ct     | gt    | gac    | cg    | tct   | ccggg | 11280 |    |     |
| ag       | ct      | g           | cat      | gt      | gtc        | ag         | agg     | tt       | ttc    | acc   | gt    | ca    | tc    | acc   | ga     | aa    | gc     | gag   | acg   | aa    | agg   | gc | ctc |

|                                                                     |       |
|---------------------------------------------------------------------|-------|
| gtgatacgcc tattttttata ggtaaagtc atgataataa tggtttctta ggacggatcg   | 11340 |
| cttgccctgta acttacacgc gcctcgtatc ttttaatgat ggaataattt gggaatttac  | 11400 |
| tctgtgttta tttatttttta tgttttgtat ttggatttta gaaagtaaata aaagaaggta | 11460 |
| gaagagttac ggaatgaaga aaaaaaata aacaaagggt taaaaaattt caacaaaaag    | 11520 |
| cgtactttac atatataattt attagacaag aaaagcagat taaatagata tacattcgat  | 11580 |
| taacgataag taaaatgtaa aatcacagga ttttcgtgtg tggctttcta cacagacaag   | 11640 |
| atgaaacaat tcggcattaa tacctgagag caggaagagc aagataaaag gtagtatttg   | 11700 |
| ttggcgatcc ccctagagtc ttttacatct tcggaaaaca aaaactattt tttctttaat   | 11760 |
| ttctttttttt acttttctatt tttaatttat atatttatat taaaaaattt aaattataat | 11820 |
| tattttttata gcacgtgatg aaaaggaccc aggtggcact tttcggggaa atgtgcgcgg  | 11880 |
| aacccttatt tgttttattt tctaaataca ttcaaataatg tatccgctca tgagacaata  | 11940 |
| accctgataa atgcttcaat aatattgaaa aaggaagagt atgagtattc aacatttccg   | 12000 |
| tgctgccctt attccctttt ttgcggcatt ttgccttcct gtttttgctc acccagaaac   | 12060 |
| gctggtgaaa gtaaaagatg ctgaagatca gttgggtgca cgagtgggtt acatcgaact   | 12120 |
| ggatctcaac agcggtaaga tccttgagag ttttcgcccc gaagaacgtt ttccaatgat   | 12180 |
| gagcactttt aaagtctctg tatgtggcgc ggtattatcc cgtattgacg ccgggcaaga   | 12240 |
| gcaactcggg cggcgcatc actattctca gaatgacttg gttgagtact caccagtcac    | 12300 |
| agaaaagcat cttacggatg gcatgacagt aagagaatta tgcagtgtg ccataaccat    | 12360 |
| gagtataac actgcggcca acttacttct gacaacgatc ggaggaccga aggagctaac    | 12420 |
| cgcttttttg cacaacatgg gggatcatgt aactcgcctt gatcgttggg aaccggagct   | 12480 |
| gaatgaagcc ataccaaacg acgagcgtga caccacgatg cctgtagcaa tggcaacaac   | 12540 |
| gttgcgcaaa ctattaactg gcgaactact tactctagct tcccggcaac aattaataga   | 12600 |
| ctggatggag gcggataaag ttgcaggacc acttctgcgc tcggcccttc cggctggctg   | 12660 |
| gtttatttgct gataaatctg gagccgggtga gcgtgggtct cgcggtatca ttgcagcact | 12720 |
| ggggccagat ggtaagccct cccgtatcgt agttatctac acgacgggga gtcaggcaac   | 12780 |

|                                                                     |       |
|---------------------------------------------------------------------|-------|
| tatggatgaa cgaaatagac agatcgctga gatagggtgcc tctactgatta agcattggta | 12840 |
| actgtcagac caagtttact catatatact ttagattgat ttaaaacttc atttttaatt   | 12900 |
| taaaaggatc taggtgaaga tcctttttga taatctcatg accaaaaatcc cttaacgtga  | 12960 |
| gttttcgttc cactgagcgt cagacccccgt agaaaagatc aaaggatctt cttgagatcc  | 13020 |
| tttttttctg cgcgtaatct gctgcttgca aacaaaaaaaa ccaccgctac cagcggtggt  | 13080 |
| ttgtttgccg gatcaagagc taccaactct ttttccgaag gtaactggct tcagcagagc   | 13140 |
| gcagatacca aatactgtcc ttctagtgtg gccgtagtta ggccaccact tcaagaactc   | 13200 |
| tgtagcaccg cctacatacc tcgctctgct aatcctgtta ccagtggctg ctgccagtgg   | 13260 |
| cgataagtcg tgtcttaccg ggttggactc aagacgatag ttaccggata aggcgcagcg   | 13320 |
| gtcgggctga acgggggggtt cgtgcacaca gcccagcttg gagcgaacga cctacaccga  | 13380 |
| actgagatac ctacagcgtg agctatgaga aagcgccacg cttcccgaag ggagaaaggc   | 13440 |
| ggacaggtat ccggtaaagc gcagggtcgg aacaggagag cgcacgaggg agcttccagg   | 13500 |
| gggaaacgcc tggatatctt atagtctgtt cgggtttcgc cacctctgac ttgagcgtcg   | 13560 |
| atttttgtga tgctcgtcag gggggcggag cctatggaaa aacgccagca acgcggcctt   | 13620 |
| tttacggttc ctggcctttt gctggccttt tgctcacatg ttctttcctg cgttatcccc   | 13680 |
| tgattctgtg gataaccgta ttaccgcctt tgagttagct gataccgctc gccgcagccg   | 13740 |
| aacgaccgag cgcagcgagt cagttagcga ggaagcggaa gagcgcccaa tacgcaaacc   | 13800 |
| gcctctcccc gcgcgttggc cgattcatta atgcagctgg cacgacaggt ttcccgactg   | 13860 |
| gaaagcgggc agtgagcgca acgcaattaa tgtgagttac ctactcatt aggacccca     | 13920 |
| ggctttacac tttatgcttc cggctcctat gttgtgtgga attgtgagcg gataacaatt   | 13980 |
| tcacacagga aacagctatg accatgatta cgccaagcgc gcaat                   | 14025 |

<210> 3  
 <211> 684  
 <212> DNA  
 <213> *Saccharomyces cerevisiae*

<220>  
 <221> Acc1 promoter  
 <222> (1)..(463)

<220>  
 <221> gRNA\_3  
 <222> (53)..(72)

<220>  
 <221> gRNA\_2  
 <222> (265)..(284)

<220>  
 <221> gRNA\_1  
 <222> (339)..(358)

<400> 3  
 ggtagaaact tgattttttc taattttctg cgctgtttcg ggaacggaaa aaaattaagc 60  
 tagaagacga atcgggttatt atactattat atttgtatag tatagtagcg tgtcgtatcg 120  
 tatcgtgtcg tatcgtatcg tatcgttaaa agaaaataca cgaataaata ataatatgtg 180  
 gagaagaaaa aggggaagttt cttgtctctt gctctgaatc tgaattccaa ttcaagttca 240  
 aattgttctc tagttttattg tccaaaaata aggatgaagc gggaggggaag ggcagagggga 300  
 aaagttcgtg tagtagaatg aataaaacttt tataaacaca tgcaccgatc actcacagag 360  
 gataaaaaaaaa tggcacaaca aatatatata tatagatgca aatggcgatt gcaaattagg 420  
 gaattggctt tgttggtttt tatcttcagg taaactgtac gaaagggata aaaagagtag 480  
 aataaggaaa ggaaaattga agagagcaga acaattgtag aaccgataac aattgtgaca 540  
 gtgattgtgc taggctatac tgtgccagaa tacgactggg agtgctgttc ttcttatata 600  
 tcttggcgct gattgagcgt atagcctagt tcaccaagca gtagagagag tggcaatgag 660  
 cggttgaatt tcgactgcga cttg 684

<210> 4  
 <211> 971  
 <212> DNA  
 <213> Artificial Sequence

<220>  
 <223> PGK1 promoter and integration sequences for *Saccharomyces cerevisiae* Acc1 promoter

<220>

<221> PGK1p

<222> (7)..(750)

<400> 4

|                                                                    |     |
|--------------------------------------------------------------------|-----|
| tgttttatat ttgttgtaaa aagtagataa ttacttcctt gatgatctgt aaaaaagaga  | 60  |
| aaaagaaaagc atctaagaac ttgaaaaact acgaattaga aaagaccaaa tatgtatttc | 120 |
| ttgcattgac caatttatgc aagtttatat atatgtaaat gtaagtttca cgaggttcta  | 180 |
| ctaaactaaa ccacccccctt ggtagaaga aaagagtgtg tgagaacagg ctgttggtgt  | 240 |
| cacacgattc ggacaattct gtttgaaaga gagagagtaa cagtacgac gaacgaactt   | 300 |
| tgctctggag atcacagtgg gcatcatagc atgtgggtact aaaccctttc ccgccattcc | 360 |
| agaaccttcg attgcttggt acaaaacctg tgagccgtcg ctaggacctt gttgtgtgac  | 420 |
| gaaattggaa gctgcaatca ataggaagac aggaagtcga gcgtgtctgg gttttttcag  | 480 |
| ttttgttctt ttgcaaaca aatcacgagc gacggtaatt tctttctcga taagaggcca   | 540 |
| cgtgctttat gagggtaaca tcaattcaag aaggaggga acacttcctt tttctggccc   | 600 |
| tgataatagt atgagggtga agccaaaata aaggattcgc gcccaaatacg gcatctttaa | 660 |
| atgcaggat gcgatagttc ctactcttt cttactcac gagtaattct tgcaaatgcc     | 720 |
| tattatgcag atgttataat atctgtgcgt agggataaaa agagtagaat aaggaaagga  | 780 |
| aaattgaaga gagcagaaca attgtagaac cgataacaat tgtgacagtg attgtgctag  | 840 |
| gctatactgt gccagaatac gactgggagt gctgttcttc ttatatatct tggcgctgat  | 900 |
| tgagcgtata gcctagttca ccaagcagta gagagagtgg caatgagcgg ttgaatttcg  | 960 |
| actgcgactt g                                                       | 971 |

<210> 5

<211> 1724

<212> DNA

<213> Artificial Sequence

<220>

<223> Cassette with *Saccharomyces cerevisiae* Acc1 (S659A; S1167A) coding sequence, regulatory sequences and integration sequences

<220>

<221> T-G Ser659Ala

<222> (108)..(108)

<220>

<221> T-G ser1167ala

<222> (1602)..(1602)

<400> 5

|                                                                    |      |
|--------------------------------------------------------------------|------|
| ggcgcgccga gggtaaaaga tacaagttca cggtcgctaa atccggtaat gaccgctaca  | 60   |
| cattatttat caatggttct aaatgtgata tcatactgcg tcaactagct gatggtgggc  | 120  |
| tgctgatcgc tatcggcgct aaatcgcata ccatctattg gaaagaagaa gttgctgcta  | 180  |
| caagattatc cgttgactct atgactactt tgttggaagt tgaaaacgat ccaacccagt  | 240  |
| tgcgtactcc atccccctgg aaattgggta aattcttggg ggaaaatggg gaacacatta  | 300  |
| tcaagggcca accatatgca gaaattgaag ttatgaaaat gcaaatgcct ttggtttctc  | 360  |
| aagaaaatgg tatcgtccag ttattaaagc aacctgggtc taccattggt gcaggtgata  | 420  |
| tcatggctat tatgactctt gacgatccat ccaagggtcaa gcacgctcta ccatttgaag | 480  |
| gtatgctgcc agattttggg tctccagtta tcgaaggaac caaacctgcc tataaattca  | 540  |
| agtcattagt gtctactttg gaaaacattt tgaagggtta tgacaaccaa gttattatga  | 600  |
| acgcttcctt gcaacaattg atagaagttt tgagaaatcc aaaactgcct tactcagaat  | 660  |
| ggaaactaca catctctgct ttacattcaa gattgcctgc taagctagat gaacaaatgg  | 720  |
| aagagttagt tgcacgttct ttgagacgtg gtgctgtttt cccagctaga caattaagta  | 780  |
| aattgattga tatggccgtg aagaatcctg aatacaaccc cgacaaattg ctgggcgcag  | 840  |
| tcgtggaacc attggcggat attgctcata agtactctaa cgggttagaa gcccataaac  | 900  |
| attctatatt tgtccatttc ttggaagaat attacgaagt tgaaaagtta ttcaatggtc  | 960  |
| caaatgttcg tgaggaaaat atcattctga aattgcgtga tgaaaaccct aaagatctag  | 1020 |
| ataaagttgc gctaactgtt ttgtctcatt cgaaagtttc agcgaagaat aacctgatcc  | 1080 |
| tagctatctt gaaacattat caaccattgt gcaagttatc ttctaaagtt tctgccattt  | 1140 |
| tctctactcc tctacaacat attgttgaac tagaatctaa ggctaccgct aaggctcgtc  | 1200 |

|                                                                    |      |
|--------------------------------------------------------------------|------|
| tacaagcaag agaaattttg attcaaggcg ctttaccttc ggtcaaggaa agaactgaac  | 1260 |
| aaattgaaca tatcttaaaa tcctctgttg tgaagggtgc ctatgggtca tccaatccaa  | 1320 |
| agcgctctga accagatttg aatatcttga aggacttgat cgattctaata tacgttgtgt | 1380 |
| tcgatgtttt acttcaattc ctaacccatc aagaccaggt tgtgactgct gcagctgctc  | 1440 |
| aagtctatat tcgtcgtgct tatcgtgctt acaccatagg agatattaga gttcacgaag  | 1500 |
| gtgtcacagt tccaattggt gaatggaaat tccaactacc ttcagctgcg ttctccacct  | 1560 |
| ttccgactgt gaagtctaag atgggtatga acagggctgt tgctgtttca gatttgatcat | 1620 |
| atgttgcaaa cagtcagtca tctccgttaa gagaaggat tttgatggct gtggatcatt   | 1680 |
| tagatgatgt tgatgaaatt ttgtcacaaa gtttggggcg cgcc                   | 1724 |

<210> 6  
 <211> 3256  
 <212> DNA  
 <213> Artificial Sequence

<220>  
 <223> Cassette with *Saccharomyces cerevisiae* Maf1 coding sequence,  
 regulatory sequences and integration sequences

<220>  
 <221> L0  
 <222> (362)..(401)

<220>  
 <221> Tef1  
 <222> (402)..(895)

<220>  
 <221> L1  
 <222> (896)..(935)

<220>  
 <221> MAF1  
 <222> (936)..(2123)

<220>  
 <221> L2  
 <222> (2124)..(2163)

<220>  
 <221> PRM9t  
 <222> (2164)..(2701)

<220>  
 <221> LTP2  
 <222> (2702)..(2741)

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 aatgatttaa gcgtgcgtga agataacact acaatccatt ttaaagcaac atccacattg 60  
 agtgtatata ccacaaaggt tttttcaggg cgtttttctc gccactttat gttgacaaaa 120  
 attattaatg gaacttacaa cgttttccaaa agttagttaa atacatacgt ctattttacta 180  
 agcaagaaat atatcatgac aagcccaaatt attatattgt tatgtttaca aaaaaaaaaat 240  
 ggctatatac atcaagtctg gaggcttttt ataacaagca agtggggtaa cttagacata 300  
 agattgactt ctttgaattc aacaaaaata catacttttg atgatttcaa tggtagaagc 360  
 ataaacaaca aataatcata aaaatttttag aactagacat aaagcaacag gcgcgttgga 420  
 cttttaattt tcgaggaccg cgaatcctta catcacaccc aatccccac aagtgatccc 480  
 ccacacacca tagcttcaaa atgtttctac tcctttttta ctcttccaga ttttctcgga 540  
 ctccgcgcgc atcgccgtacca cttcaaaaca cccaagcaca gcatactaaa tttcccctct 600  
 ttcttcctct aggggtgtcgt taattacccg tactaaaggt ttggaaaaga aaaaagagac 660  
 cgcctcgttt ctttttcttc gtcgaaaaag gcaataaaaa tttttatcac gtttcttttt 720  
 cttgaaaatt tttttttttg atttttttct ctttcgatga cctcccattg atatttaagt 780  
 taataaacgg tcttcaattt ctcaagtttc agtttcattt ttcttgttct attacaactt 840  
 tttttacttc ttgctcatta gaaagaaagc atagcaatct aatctaagtt ttaatctaga 900  
 aaatttatta taaaaggaag agaaataatt aaacaatgaa atttattgat gagctagata 960  
 tagagagagt gaatcaaact ctcaatttcg agacaaatga ctgtaaaatc gtgggcagtt 1020  
 gcgatatttt cacaacaaag gcggttgcat cagatagaaa attatataaa actattgatc 1080  
 agcatttgga tactatttta caggaaaatg agaattacaa tgctaccctt cagcaacagc 1140  
 tagctgctcc cgaaacaaac caatcaccct gctcgtcgcc attttattct aataggaggg 1200  
 atagcaactc tttttgggag caaaagagaa gaatatcttt tagtgaatac aatagcaata 1260

|                                                                    |      |
|--------------------------------------------------------------------|------|
| ataacactaa caacagtaat ggcaatagca gtaataacaa taactattct ggacctaatz  | 1320 |
| gttcttctcc agcaactttt cccaaaagtg ccaagctaaa tgacccaaat ttaaaagaat  | 1380 |
| tagtctcgaa ttacgattct ggctctatga gctcatcgtc tcttgattct tcttctaaga  | 1440 |
| atgatgagag gataagaaga aggagcagta gcagtattag cagtttcaaa agtggtaaat  | 1500 |
| catcgaacaa taattacagt tctggtacag caaccaacaa tgtaacaaa agaagaaaat   | 1560 |
| cttcgataaa cgaaaggcca agcaatttaa gtttgggtcc gtttgggtccc ataaacgaac | 1620 |
| cgtcaagccg caaaatattt gcttatctga ttgctatcct caacgcttct tatcctgacc  | 1680 |
| atgatttttc atcggttgag ccaacggatt ttgtcaaaac atcattgaaa acttttattt  | 1740 |
| ccaaatttga aaacacctta tattctcttg gtagacaacc agaggaatgg gtctgggagg  | 1800 |
| taattaattc tcacatgact ctttctgatt gcgtcctttt tcaatattca ctttcaaact  | 1860 |
| cttttttggga agatgagcct ggctatcttt ggaatcttat aggttttctt tacaacagga | 1920 |
| aaaggaaaag agtggtttac ctttacttga tttgctcgcg tctaaattcg agtacaggcg  | 1980 |
| aagtggaaga tgccttggca aaaaaacctc agggaaagct tataatagat gatggctcaa  | 2040 |
| atgaatacga aggagaatac gatttcactt atgatgagaa tgtaatagat gataaatcag  | 2100 |
| atcaagaaga atccctacag tagagacata aaactgaaac aacaccaatt aataatagac  | 2160 |
| tttacagaag acgggagaca ctagcacaca actttaccag gcaagggtatt tgacgctagc | 2220 |
| atgtgtccaa ttcagtgtca tttatgattt tttgtagtag gatataaata tatacagcgc  | 2280 |
| tccaaatagt gcggttgccc caaaaacacc acggaacctc atctgttctc gtactttgtt  | 2340 |
| gtgacaaaag agctcactgc cttattatca catthttcatt atgcaacgct tcggaaaata | 2400 |
| cgatgttgaa aatgcctcta gagatgaaaa acaatcgtaa aagggtcctg cgtaattgaa  | 2460 |
| acatttgatc agtatgcagt ggacacagaaa caaccaggaa tactatagtc ataggcaata | 2520 |
| caaggatatat attggctatg cagaccctc cagaaagtac cgacgtcaag ttagatacac  | 2580 |
| ttaacgaacc tagtgcacat ttaattgaga aaaatgtggc tcttcctaag gacatattcc  | 2640 |
| gttcgtactt gagttattgg atctatgaaa tcgctcgcta tacaccagtc atgattttgt  | 2700 |
| ccttaaataa catactcatc actaaacatt cttacaatc agaaaacaac gcgtcatgaa   | 2760 |

|                                                                   |      |
|-------------------------------------------------------------------|------|
| aaagagttac tgaaccttca gacccactt attgtaatgc ttcgcgacat ccaatccatt  | 2820 |
| taataatcaa tttaaaacta gagttggtag agttccttgt tgaacgtgat aacccaaaag | 2880 |
| cataatacga gtaatgtttc agtattgcta ttatatgttt acacaaggaa aacatataat | 2940 |
| aacaaacctc taatccggta gtacttaaga aactatagtt tctatgtaca aaaaggtaac | 3000 |
| tatgtaattc ttacatttac ataacgtata gaagggtcca ataaacttac taaacttact | 3060 |
| accttggtgt atataggcta gatcgtaatc cactacgtca acataaaaaa aacttaagaa | 3120 |
| gtttgaattt tatgtacaaa cagattgtta aaatataata taagattatg gaaacgaact | 3180 |
| tgctctaaaa aaaatttaaa gttttataaa atcctcgaac tatcgctgtt atacatgatg | 3240 |
| tccccaaagc gtgtac                                                 | 3256 |

<210> 7  
 <211> 4662  
 <212> DNA  
 <213> Artificial Sequence

<220>  
 <223> Cassette with *Saccharomyces cerevisiae* UPC2E888D coding sequence,  
 regulatory sequences and integration sequences

<220>  
 <221> L0  
 <222> (401)..(440)

<220>  
 <221> Tef1  
 <222> (441)..(934)

<220>  
 <221> L1  
 <222> (935)..(974)

<220>  
 <221> UPC2-1  
 <222> (975)..(3701)

<220>  
 <221> g-a G888D  
 <222> (3637)..(3637)

<220>  
 <221> L2  
 <222> (3702)..(3741)

<220>  
 <221> PRM9t  
 <222> (3742)..(4279)

<220>  
 <221> LTP2  
 <222> (4280)..(4319)

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 cccagttggt ttagctggt tcatatttag cggcaattct ctgttgcgta aatgaaaata 60  
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 aatgtgttta gagtctactg atatgttact gaccgttcgt tgggaaaaaa atactgtatc 180  
 atttattaat caaaagcgac ttttggtgga atattatgat atgtgttggt aaaatatgac 240  
 gtaatttttag aattgtctga ttcgtattca aatttggtga aggaataacg cagagttgac 300  
 aatttaatag aatggattaa tcgtaatttt cagaaacgta gaaaaagaaa aacaattaa 360  
 acattatatt aagattattg atttgccttt taagggtcca taaacaacaa ataatcataa 420  
 aaattttaga actagacata aagcaacagg cgcgttggac ttttaatttt cgaggaccgc 480  
 gaatccttac atcacacca atccccaca agtgatcccc cacacaccat agcttcaaaa 540  
 tgtttctact ctttttttac tcttccagat tttctcggac tccgcgcac gccgtaccac 600  
 ttcaaaacac ccaagcacag cataactaat ttcccccttt tcttcctcta ggggtgtcgtt 660  
 aattaccgt actaaagggt tggaaaagaa aaaagagacc gcctcgtttc tttttcttcg 720  
 tcgaaaaagg caataaaaat ttttatcacg tttctttttc ttgaaaattt ttttttttga 780  
 tttttttctc tttcgtgac ctccattga tatttaagtt aataaacggt cttcaatttc 840  
 tcaagtttca gtttcatttt tcttgttcta ttacaacttt ttttacttct tgctcattag 900  
 aaagaaagca tagcaatcta atctaagttt taatctagaa aatttattat aaaaggaaga 960  
 gaaataatta aacaatgagc gaagtcggta tacagaatca caagaaagcg gtgacaaaac 1020  
 ccagaagaag agaaaaagtc atcgagctaa ttgaagtgga cggcaaaaag gtgagtacga 1080  
 cttcaaccgg taaacgtaaa ttccataaca aatcaaagaa tgggtgcgat aactgtaaaa 1140

|                                                                    |      |
|--------------------------------------------------------------------|------|
| gaagaagagt taagtgtgat gaagggaagc cagcctgtag gaagtgcaca aatatgaagt  | 1200 |
| tggaatgtca gtatacacca atccatttaa ggaaaggttag aggagcaaca gtagtgaagt | 1260 |
| atgtcacgag aaaggcagac ggtagcgtgg agtctgattc atcggtagat ttacctccta  | 1320 |
| cgatcaagaa ggagcagaca ccgttcaatg atatccaatc agcggtaaaa gcttcaggct  | 1380 |
| catccaatga ttcctttcca tcaagcgcct ctacaactaa gagtgagagc gagggaaaagt | 1440 |
| catcggcccc tatagaggac aaaaacaata tgactcctct aagtatgggc ctccagggtta | 1500 |
| ccatcaataa gaaagatatg atgaataact ttttctctca aaatggcact attggttttg  | 1560 |
| gttctcctga aagattgaat tcaggtatcg atggcttact attaccgcca ttgccttctg  | 1620 |
| gaaatatggg tgcgttccaa cttcagcaac agcagcaagt gcagcagcaa tctcaaccac  | 1680 |
| agacccaagc gcagcaagca agtggaactc caaacgagag atatggttca ttcgatcttg  | 1740 |
| cgggtagtcc tgcattgcaa tccacgggaa tgagcttatc aaatagtcta agcgggatgt  | 1800 |
| tactatgtaa caggattcct tccggccaaa actacactca acaacaatta caatatcaat  | 1860 |
| tacaccagca gctgcaattg caacagcatc agcaagttca gctgcagcag tatcaacaat  | 1920 |
| tacgtcagga acaacaccaa caagttcagc aacaacaaca ggaacaactc cagcaatacc  | 1980 |
| aacaacattt tttgcaacag cagcaacaag tactgcttca gcaagagcaa caacctaacg  | 2040 |
| atgaggaagg tggcgttcag gaagaaaaca gcaaaaaggt aaaggaaggg cttttacaat  | 2100 |
| cacaaacaag cgaaactact ttaaacagcg atgctgctac attacaagct gatgcattat  | 2160 |
| ctcagttaag taagatgggg ctaagcctaa agtcgttaag tacctttcca acagctggta  | 2220 |
| ttggtggtgt ttcctatgac tttcaggaac tgttaggtat taagtttcca ataaataacg  | 2280 |
| gcaattcaag agctactaag gccagcaacg cagaggaagc tttggccaat atgcaagagc  | 2340 |
| atcatgaacg tgcagctgct tctgtaaagg agaatgatgg tcagctctct gatacgaaga  | 2400 |
| gtccagcgcc atcgaataac gccaagggg gaagtgctag tattatggaa cctcaggcgg   | 2460 |
| ctgatgcggt ttcgacaatg gcgcctatat caatgattga aagaaacatg aacagaaaca  | 2520 |
| gcaacatttc tccatcaacg ccctctgcag tgttgaatga taggcaagag atgcaagatt  | 2580 |
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| gtttacaaac atcacagaca gagaatgaag acgatgcatc gcggcaagac atgacctcaa  | 2700 |
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| ttttagatct ttctaccaa ggcaatctga acctgataga catgaaactg tttcatcatt   | 2820 |
| attgcacaaa ggtctggcct acgattacag cggccaaagt ttctgggcct gaaatatgga  | 2880 |
| gggactacat accggagtta gcatttgact atccattttt aatgcacgct ttgttggcat  | 2940 |
| tcagtgccac ccatctttcg aggactgaaa ctggactgga gcaatacgtt tcatctcacc  | 3000 |
| gcctagacgc tctgagatta ttaagagaag ctgtttttaga aatatctgag aataacaccg | 3060 |
| atgcgctagt tgccagcgcc ctgatactaa tcatggactc gttagcaa at gctagtggta | 3120 |
| acggcactgt aggaaaccaa agtttgaata gcatgtcacc aagcgcttgg atctttcatg  | 3180 |
| tcaaaggtgc tgcaacaatt ttaaccgctg tgtggccttt gagtgaaaga tctaaatttc  | 3240 |
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| tataaatata tacagcgctc caaatagtgc ggttgcccca aaaacaccac ggaacctcat  | 3900 |
| ctgttctcgt actttgttgt gacaaagtag ctactgcct tattatcaca ttttcattat   | 3960 |
| gcaacgcttc ggaaaaatcg atgttgaaaa tgccctctaga gatgaaaaac aatcgtaaaa | 4020 |
| gggtcctgcg taattgaaac atttgatcag tatgcagtgg cacagaaaca accaggaata  | 4080 |
| ctatagtcat aggcaataca aggtatatat tggctatgca gaccctcca gaaagtaccg   | 4140 |

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| gatggatgat gattggthct tatcataatt tgatttcggc agaagcaata ttagaggat    | 4380 |
| tgttgtaacg aaattccaat gtcactgtct tagtattatt aatgttacct gcatattatc   | 4440 |
| acatgccgct taaaaatgtg ttataagtat taaaatctag tgaaagttga aatgtaatct   | 4500 |
| aataggataa tgaaacatat gaaacggaat gaggaataat cgttgtatta ctatgtagag   | 4560 |
| atatcgatth cattttgagg attcctatat tcttggggag aacttctact atattctgta   | 4620 |
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 <213> Artificial Sequence

<220>  
 <223> Cassette with *Aspergillus nidulans* NpgA coding sequence,  
 regulatory sequences and integration sequences

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 ctccaatttt gactagatgg tacattgata ccagaccatt gactgcttct actgctgctt 1260

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| actgcagaat tccatggtcc tctatcgta tttctagaac tccagatcca catagaaggc     | 1440 |
| catgttatat tccaccatct ggttctcaag aggattcttt taaagatggt tacaccggt     | 1500 |
| tcaacgtcga gtttaatgtt tctcatcaag cctccatggt tgctattgct ggtactgctt    | 1560 |
| ttactccaaa ttctgggtgg gattctaagt tgaaaccaga agttgggtatc gatattacct   | 1620 |
| gcgtcaacga aagacaagggt agaaatgggtg aagaaagggtc cttggaatct ttgagacagt | 1680 |
| acatcgatat cttctccgaa gttttctcta ctgctgaaat ggccaacatt agaagattgg    | 1740 |
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| tctatactta ctgggctttg aaagaagcct acattaagat gactgggtgaa gccttggttg   | 1860 |
| ctccatgggt gagagaattg gaattctcta atgttggtgc tccagctgct gttgctgaat    | 1920 |
| ctgggtgattc tgctgggtgat tttgggtgaac catatactgg tgtagaacc acctgtaca   | 1980 |
| agaacttgggt tgaagatgtt agaattgaag ttgctgcttt gggtgggtgat tacttggttg  | 2040 |
| ctactgctgc tagagggtgg ggtattgggt cttcttctag accagggtgg ggtccagatg    | 2100 |
| gttctgggtat tagatctcaa gatccttgga ggccattcaa gaagttggat attgaaaggg   | 2160 |
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| ggcaagggtat ttgacgctag catgtgtcca attcagtgtc atttatgatt tttttagta    | 2340 |
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| tatgcaacgc ttcggaaaat acgatgttga aaatgcctct agagatgaaa aacaatcgta    | 2520 |
| aaagggtcct gcgtaattga aacatttgat cagtatgcag tggcacagaa acaaccagga    | 2580 |
| atactatagt cataggcaat acaagggtata tattggctat gcagaccctt ccagaaagta   | 2640 |
| ccgacgtcaa gttagatata cttaacgaac ctagtgcaca ttttaattgag aaaaatgtgg   | 2700 |
| ctcttcctaa ggacatattc cgttcgtact tgagttattg gatctatgaa atcgctcgct    | 2760 |

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| caaaaaaatg ccggcctatt acaagctact gttcaataaa tattgttgta atgaagacgg   | 2940 |
| tccaactgta caaatacagc aaactgtcat atataagggtg tcttatgtga cagcacttgc  | 3000 |
| gttattgtca gccggagtat gtctttgtcg cattctgggc tttttacttt ctgctcagaa   | 3060 |
| ggaagtacga acaagaaaaa aaaatcacca atgcttccct tttcagtatt agtttcatat   | 3120 |
| ttgtttacgt tcaaactcgt cgtttgcgcg ataacctcta aaaaagtcag ttacgtaact   | 3180 |
| atatcaatca gagaatgcaa aaagcactat cataaaaaatg tctctagggg atgtgagaca  | 3240 |
| tgtcaattat aagaagtgat ggtgtcatag tatatatatc ataaatgatt atcaaagttt   | 3300 |
| caatcctttg tatttttctag ttttagcgcca acttttgaca aaacctaaac tttagataat | 3360 |
| catcattctt acaattttta tctggatggc aataatctcc tatataaagc ccagataaac   | 3420 |
| tgtaaaaaaga atccatcact atttgaaaaa aagtcacttg gcacgtttaa ttatcagagc  | 3480 |
| agaaatgatg aagggtgtta gcgccgtcca ttgatgcgcc tggtagtcat gatttacgta   | 3540 |
| taactaacac atcatgagga cggc                                          | 3564 |

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 <211> 10584  
 <212> DNA  
 <213> Artificial Sequence

<220>  
 <223> Cassette with Dictyostelium discoideum DiPKS (G1516D; G1518A)  
 coding sequence, regulatory sequences and integration sequences

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<221> C-methyltransferase domain

<222> (5050)..(5412)

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<222> (5050)..(5076)

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<221> G1516D

<222> (5068)..(5070)

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<221> G1518A

<222> (5074)..(5076)

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<221> Motif 2

<222> (5309)..(5331)

<220>

<221> Motif 3

<222> (5389)..(5421)

<220>

<221> L2

<222> (9967)..(10006)

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<221> PRM9t

<222> (10007)..(10544)

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<221> LV5

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tcctgaaacg cagatgtgcc tcgcgccgca ctgctccgaa caataaagat tctacaatac 180

tagcttttat ggttatgaag aggaaaaatt ggcagtaacc tggccccaca aaccttcaaa 240

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| aactgcataa ccactttaac taatactttc aacattttcg gtttgtatta cttcttattc   | 420  |
| aaatgtaata aaagtatcaa caaaaaattg ttaatatacc tctatacttt aacgtcaagg   | 480  |
| agctagaaaa tttattataa aaggaagaga aataattaa caatgaacaa gaactccaaa    | 540  |
| atccagtccc caaactcttc tgatgttgct gttattgggtg ttggtttttag attcccaggt | 600  |
| aactctaattg acccagaatc tttgtggaac aacttggttg atggtttcga tgctattacc  | 660  |
| caagtcccaa aagaaagatg ggctacttct tttagagaga tgggtttgat caagaacaag   | 720  |
| ttcggtggtt tcttgaagga ttctgaatgg aagaatttcg accctttggt ctttggtatc   | 780  |
| ggtccaaaag aagctccatt cattgatcca caacaaaggt tgttggtgtc catcggttg    | 840  |
| gaatctttgg aagatgctta catcagacca gatgaattga gaggttctaa cactggtgtt   | 900  |
| ttcatcggtg tttctaacaa cgattacacc aagttgggtt tccaagacaa ctactctatt   | 960  |
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| gaaaatggca gatgcaactc ttttagtgat caagcctctg gttacgttag atctgaaggt   | 1260 |
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| gaaccattat tgattggctc attcaagtcc aacatcggtc atttggaatc tgctgctggt   | 1680 |
| attgcttctt tgattaagtg ttgcttgatg ttgaagaaca ggatgttggt tccatccatt   | 1740 |

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| ggtggttcta actgccattt gattattcaa gagtacaaca acaacttcaa gaacaactct   | 1920 |
| accatctgca ataacaacaa caacaacaat aacaacatcg actacttgat cccaatctcc   | 1980 |
| tctaagacta agaagtcctt ggataagtac ttgattttga tcaagaccaa ctccaactac   | 2040 |
| cacaaggata tttctttcga tgacttcgtc aagttccaaa tcaagtctaa gcagtacaac   | 2100 |
| ttgtccaaca gaatgactac cattgctaac gattggaact ctttcattaa gggttctaac   | 2160 |
| gaattccaca acttgatcga atctaaggat ggtgaagggtg gttcttcatc ttctaacaga  | 2220 |
| ggtattgatt ccgccaatca aatcaacact actactacct ctaccatcaa cgatatcgaa   | 2280 |
| cctttgttgg ttttcgtttt ctgtgggtcaa ggtccacaat ggaatgggtat gattaagacc | 2340 |
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| atctctaagt gtaatcctgt tggatgatgtg atcaccaact tctctatgag attgccaaag   | 7380 |
| ccaaactacc agttgaatth gaactccacc ttgttgatta ctggtcagtc tggtttgtct    | 7440 |
| atcccccttgt tgaattgggtt gttgtctaag tctgggtggta acgttaagaa cgttgtcatc | 7500 |
| atttctaagt ccacatgaa gtggaagttg cagactatga tttcccatth cgtttccggt     | 7560 |
| ttcggtatcc attttaacta cgttcaagtc gacatctcca actacgatgc tttgtctgaa    | 7620 |
| gctattaagc aattgccatc tgatttgcca ccaatcacct ctgtttttca tttggctgct    | 7680 |
| atctacaacg atgttccaat ggatcaagtt accatgtcta ccgttgaatc tgttcataac    | 7740 |
| cctaaagttt tgggtgccgt taacttgcac agaactctctg tttcttttgg ttggaagttg   | 7800 |
| aaccacttcg tcttgttctc ttctattact gctattaccg gttaccacga ccaatctatc    | 7860 |
| tacaattctg ccaactctat tttggacgct ttgtccaact ttagaagggtt tatgggtttg   | 7920 |
| ccatccttct ccattaactt ggggtccaatg aaggatgaag gtaaggtttc taccaacaag   | 7980 |
| agcatcaaga agctattcaa gtctagaggt ttgccaagcc tatccttgaa caagttatth    | 8040 |
| ggtttgttgg aggtcgtcat caacaaccca tctaactcatg ttatcccatc ccaattgatt   | 8100 |
| tgctcccca a tcgatttcaa gacctacatc gaatctttct caactatgag gccaaagttg   | 8160 |
| ttacacttgc aacctaccat ttccaagcag caatcttcta tcattaacga ttctaccaag    | 8220 |
| gcttcctcca acatttcatg gcaagataag atcacctcca aggtgtctga tttgttgtcc    | 8280 |
| attccaatct ccaagatcaa cttcgatcat ccattgaaac actacggctt ggattctttg    | 8340 |
| ttgaccgttc aattcaaatc ctggatcgac aaagaattcg aaaagaactt gttcacccat    | 8400 |
| atccaattgg ccacatctc tattaactca ttcttggaaa aggtgaacgg cttgtctaca     | 8460 |
| aacaataaca acaacaacaa ttccaacgac aagtcctctc catccattgt caaagaagaa    | 8520 |
| atcgttacct tggacaagga tcaacaacca ttgctattga aagaacacca gcacattatc    | 8580 |
| atctccccag atattagaat caacaagcca aagagggaat ccttgattag aacccaatc     | 8640 |
| ttgaacaaat tcaaccagat caccgaatcc attatcactc catctacacc atctttgtcc    | 8700 |
| caatccgatg ttttgaaaac tccaccaatc aagtccttga acaacactaa gaactccagc    | 8760 |
| ttgattaaca cccaccaat tcaatctgtc caacaacatc aaaagcaaca acaaaaggtc     | 8820 |

|                                                                       |       |
|-----------------------------------------------------------------------|-------|
| caagtcaccc aacaacagca acaaccatta tccagattgt cctacaagag caacaacaac     | 8880  |
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| aaagactcca tctccaatga ctttttctgat aaggctgaaa ctaacgagaa ggtcaagaga    | 9000  |
| atctttgagc aatctcaaata caagaccaga cacttggtta gagattacac taagccagag    | 9060  |
| aactccatca agttcagaca tttggaaacc attaccgatg tgaacaacca gttcaagaaa     | 9120  |
| gttggtccag atttggttca acaagcctgt ttgagagctt tgaaagattg ggggtggtgat    | 9180  |
| aagggtgata ttacccatat agttttctggt acctccaccg gtattatcat cccagatggt    | 9240  |
| aattttcaagt tgatcgactt gttgggcttg aacaaggatg ttgaaagagt gtctttgaac    | 9300  |
| ctaattgggtt gtttggttgg tttgagttct ttgagaactg ctgcttcttt ggctaaggct    | 9360  |
| tctccaagaa atagaatttt ggttgtctgt accgaagtct gtccttgca tttttctaata     | 9420  |
| actgatggtg gtgatcaaata ggtcgcctct tctatttttg ctgatggttc tgctgcttac    | 9480  |
| attattgggtt gtaacccaag aattgaagaa accccattat acgaagtcac gtgctccatt    | 9540  |
| aacagatctt tcccaaatac cgaaaacgcc atgggtttggg atttggaataa agaagggttg   | 9600  |
| aacttgggtt tggatgcttc tattccaatt gtcattgggt ctggtattga agccttcggt     | 9660  |
| gatactttgt tggataaggc taagttgcaa acttccactg ctattttctgc taaggattgc    | 9720  |
| gaattcttga ttcatactgg tggcaagtcc atcttgatga acatcgaaaa ttccttgggt     | 9780  |
| atcgacccaa agcaaaactaa gaatacttgg gatgtttacc atgcctacgg caatatgtca    | 9840  |
| tctgcctctg ttatttttcgt tatggatcat gccagaaagt ccaagtcttt gccaacttac    | 9900  |
| tcaatttctt tggcttttgg tccaggtttg gcttttgaag gttgtttctt gaagaacgct     | 9960  |
| gtctaaagac ataaaaactga aacaacacca attaataata gactttacag aagacgggag    | 10020 |
| acactagcac acaactttac caggcaagggt atttgacgct agcatgtgtc caattcagtg    | 10080 |
| tcattttatga tttttttag taggatataa atatatacag cgctccaaat agtgcggttg     | 10140 |
| ccccaaaaac accacggaac ctcatctgtt ctcgtacttt gttgtgacaa agtagctcac     | 10200 |
| tgctttatta tcacattttc attatgcaac gcttcggaaa atacgatgtt gaaaatgcct     | 10260 |
| ctagagatga aaaacaatcg taaaagggtc ctgcgtaatt gaaacatttg atcagtatgc     | 10320 |

|                                                                   |       |
|-------------------------------------------------------------------|-------|
| agtggcacag aaacaaccag gaatactata gtcataggca atacaaggta tatattggct | 10380 |
| atgcagaccc ctccagaaag taccgacgtc aagttagata cacttaacga acctagtgc  | 10440 |
| catttaattg agaaaaatgt ggctcttcct aaggacatat tccgttcgta cttgagttat | 10500 |
| tggatctatg aaatcgctcg ctatacacca gtcatgattt tgtccctctt tatattacat | 10560 |
| caaaataaga aaataattat aaca                                        | 10584 |

<210> 14  
 <211> 4909  
 <212> DNA  
 <213> Artificial Sequence

<220>  
 <223> Cassette with Cas9 coding sequence, regulatory sequences and integration sequences

<220>  
 <221> LV3  
 <222> (1)..(40)

<220>  
 <221> TEF1p  
 <222> (41)..(446)

<220>  
 <221> Cas9  
 <222> (470)..(4609)

<220>  
 <221> LV5  
 <222> (4870)..(4909)

|                                                                   |     |
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| <400> 14                                                          |     |
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| ctcctttttt actcttccag attttctcgg actccgcgca tcgccgtacc acttcaaaac | 120 |
| accaagcac agcatactaa atttcccctc tttcttcctc taggggtgtcg ttaattaccc | 180 |
| gtactaaagg tttggaaaag aaaaaagaga ccgcctcgtt tctttttctt cgtcgaaaaa | 240 |
| ggcaataaaa atttttatca cgtttctttt tcttgaaaat ttttttttg attttttct   | 300 |
| ctttcgatga cctcccattg atatttaagt taataaacgg tcttcaattt ctcaagtttc | 360 |

|                                                                    |      |
|--------------------------------------------------------------------|------|
| agtttcattt ttcttgttct attacaactt tttttacttc ttgctcatta gaaagaaagc  | 420  |
| atagcaatct aatctaagtt ttctagaact agtggatccc ccgggaaaaa tggacaagaa  | 480  |
| gtactccatt gggctcgata tcggcacaaa cagcgtcggc tgggccgtca ttacggacga  | 540  |
| gtacaaggtg ccgagcaaaa aattcaaagt tctgggcaat accgatcgcc acagcataaa  | 600  |
| gaagaacctc attggcgccc tcctgttcga ctccggggag acggccgaag ccacgcggct  | 660  |
| caaaagaaca gcacggcgca gatatacccg cagaaagaat cggatctgct acctgcagga  | 720  |
| gatcttttagt aatgagatgg ctaaggtgga tgactctttc ttccataggc tggaggagtc | 780  |
| ctttttggtg gaggaggata aaaagcacga gcgccacca atctttggca atatcgtgga   | 840  |
| cgaggtggcg taccatgaaa agtaccacaac catatatcat ctgaggaaga agcttgtaga | 900  |
| cagtactgat aaggctgact tgcggttgat ctatctcgcg ctggcgcata tgatcaaatt  | 960  |
| tcggggacac ttctcatcg agggggacct gaaccagac aacagcgatg tcgacaaact    | 1020 |
| ctttatccaa ctggttcaga cttacaatca gcttttcgaa gagaaccga tcaacgcac    | 1080 |
| cggagttgac gccaaaagcaa tcctgagcgc taggctgtcc aaatcccggc ggctcgaaaa | 1140 |
| cctcatcgca cagctccctg gggagaagaa gaacggcctg tttggtaatc ttatcgccct  | 1200 |
| gtcactcggg ctgaccccca actttaaatc taacttcgac ctggccgaag atgccaagct  | 1260 |
| tcaactgagc aaagacacct acgatgatga tctcgacaat ctgctggccc agatcggcga  | 1320 |
| ccagtacgca gacctttttt tggcggcaaa gaacctgtca gacgccattc tgctgagtga  | 1380 |
| tattctgcga gtgaacacgg agatcaccaa agctccgctg agcgctagta tgatcaagcg  | 1440 |
| ctatgatgag caccaccaag acttgacttt gctgaaggcc cttgtcagac agcaactgcc  | 1500 |
| tgagaagtac aaggaaaattt tcttcgatca gtctaaaaat ggctacgccg gatacattga | 1560 |
| cggcggagca agccaggagg aattttacaa atttattaag cccatcttgg aaaaaatgga  | 1620 |
| cggcaccgag gagctgctgg taaagcttaa cagagaagat ctgttgcgca aacagcgcac  | 1680 |
| tttcgacaat ggaagcatcc cccaccagat tcacctgggc gaactgcacg ctatcctcag  | 1740 |
| gcggcaagag gatttctacc cttttttgaa agataacagg gaaaagattg agaaaaatcct | 1800 |
| cacatttcgg atacctact atgtaggccc cctcgcccgg ggaaattcca gattcgcgtg   | 1860 |

|                                                                    |      |
|--------------------------------------------------------------------|------|
| gatgactcgc aaatcagaag agaccatcac tccctggaac ttcgaggaag tcgtggataa  | 1920 |
| gggggcctct gccagtcct tcatcgaaag gatgactaac ttgataaaa atctgcctaa    | 1980 |
| cgaaaagggtg cttcctaaac actctctgct gtacgagtac ttcacagttt ataacgagct | 2040 |
| caccaagggtc aaatacgtca cagaagggat gagaaagcca gcattcctgt ctggagagca | 2100 |
| gaagaaagct atcgtggacc tcctcttcaa gacgaaccgg aaagttaccg tgaaacagct  | 2160 |
| caaagaagac tatttcaaaa agattgaatg tttcgactct gttgaaatca gcggagtgga  | 2220 |
| ggatcgcttc aacgcatccc tgggaacgta tcacgatctc ctgaaaatca ttaaagacaa  | 2280 |
| ggacttcctg gacaatgagg agaacgagga cattcttgag gacattgtcc tcacccttac  | 2340 |
| gttgtttgaa gatagggaga tgattgaaga acgcttgaaa acttacgctc atctcttcga  | 2400 |
| cgacaaaagtc atgaaacagc tcaagaggcg ccgatataca ggatgggggc ggctgtcaag | 2460 |
| aaaactgatc aatgggatcc gagacaagca gagtggaaag acaatcctgg attttcttaa  | 2520 |
| gtccgatgga ttgccaacc ggaacttcat gcagttgatc catgatgact ctctcacctt   | 2580 |
| taaggaggac atccagaaaag cacaagtttc tggccagggg gacagtcttc acgagcacat | 2640 |
| cgctaatctt gcaggtagcc cagctatcaa aaagggaata ctgcagaccg ttaaggtcgt  | 2700 |
| ggatgaactc gtcaaagtaa tgggaaggca taagcccag aatatcgta tcgagatggc    | 2760 |
| ccgagagaac caaactaccc agaagggaca gaagaacagt agggaagga tgaagggat    | 2820 |
| tgaagagggt ataaaagaac tggggtccca aatccttaag gaacaccag ttgaaaacac   | 2880 |
| ccagcttcag aatgagaagc tctacctgta ctacctgcag aacggcaggg acatgtacgt  | 2940 |
| ggatcaggaa ctggacatca atcggctctc cgactacgac gtggatcata tcgtgcccc   | 3000 |
| gtcttttctc aaagatgatt ctattgataa taaagtgttg acaagatccg ataaaaatag  | 3060 |
| agggaagagt gataacgtcc cctcagaaga agttgtcaag aaaatgaaaa attattggcg  | 3120 |
| gcagctgctg aacgccaac tgatcacaca acggaagttc gataatctga ctaaggctga   | 3180 |
| acgagggtggc ctgtctgagt tggataaagc cggcttcac aaaaggcagc ttgttgagac  | 3240 |
| acgccagatc accaagcacg tggcccaa atctcgattca cgcataga ccaagtacga     | 3300 |
| tgaaaatgac aaactgattc gagagggtgaa agttattact ctgaagtcta agctggtctc | 3360 |

|                                                                     |      |
|---------------------------------------------------------------------|------|
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| gcatgatgcc tacctgaatg cagtggtagg cactgcactt atcaaaaaat atcccaagct   | 3480 |
| tgaatctgaa tttgtttacg gagactataa agtgtacgat gttaggaaaa tgatcgcaaa   | 3540 |
| gtctgagcag gaaataggca aggccaccgc taagtacttc ttttacagca atattatgaa   | 3600 |
| ttttttcaag accgagatta cactggccaa tggagagatt cggaagcgac cacttatcga   | 3660 |
| aacaaacgga gaaacaggag aaatcgtgtg ggacaagggt agggatttcg cgacagtccg   | 3720 |
| gaaggtcctg tccatgccgc aggtgaacat cgttaaaaag accgaagtac agaccggagg   | 3780 |
| cttctccaag gaaagtatcc tcccgaagaag gaacagcgac aagctgatcg cacgcaaaaa  | 3840 |
| agattgggac cccaagaaat acggcggatt cgattctcct acagtcgctt acagtgtact   | 3900 |
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| tgagcttgaa aacggccgga aacgaatgct cgctagtgcg ggcgagctgc agaaaggtaa   | 4140 |
| cgagctggca ctgccctcta aatacgttaa tttcttgtat ctggccagcc actatgaaaa   | 4200 |
| gctcaaaggg tctcccgaag ataatgagca gaagcagctg ttcgtggaac aacacaaaca   | 4260 |
| ctaccttgat gagatcatcg agcaaataag cgaattctcc aaaagagtga tcctcgccga   | 4320 |
| cgctaacctc gataagggtc tttctgctta caataagcac agggataagc ccatcaggga   | 4380 |
| gcaggcagaa aacattatcc acttgtttac tctgaccaac ttgggcgcgc ctgcagcctt   | 4440 |
| caagtacttc gacaccacca tagacagaaa gcggtacacc tctacaaagg aggtcctgga   | 4500 |
| cgccacactg attcatcagt caattacggg gctctatgaa acaagaatcg acctctctca   | 4560 |
| gctcgggtgga gacagcaggg ctgaccccaa gaagaagagg aagggtgtgat ctcttctcga | 4620 |
| gtcatgtaat tagttatgtc acgcttacat tcacgccctc cccccacatc cgctctaacc   | 4680 |
| gaaaaggaag gagttagaca acctgaagtc taggtcccta tttatTTTTT tatagttatg   | 4740 |
| ttagtattaa gaacgttatt tatatttcaa atttttctt ttttctgta cagacgcgtg     | 4800 |
| tacgcatgta acattatact gaaaaccttg cttgagaagg ttttgggacg ctcgaaggct   | 4860 |

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4909