

CX2-126USP1_ST25
SEQUENCE LISTING

<110> Codexis, Inc.
TANG, Weng Lin
HSIEH, Helen
PHAM, Son
SMITH, Derek
COLLIER, Steven

<120> ENGINEERED BIOCATALYSTS AND METHODS FOR SYNTHESIZING CHIRAL AMINES

<130> CX2-126USP1

<160> 204

<170> PatentIn version 3.5

<210> 1
<211> 1362
<212> DNA
<213> Artificial Sequence

<220>
<223> Engineered variant of V. fluvialis transaminase

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CX2-126USP1_ST25

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<223> Engineered variant of V. fluvialis transaminase

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Tyr Gly Phe Thr Asp Met Pro Ser Leu His Gln Arg Gly Thr Val Val
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Val Thr His Gly Glu Gly Pro Tyr Ile Val Asp Val His Gly Arg Arg
35 40 45

Tyr Leu Asp Ala Asn Ser Gly Leu Leu Asn Met Val Ala Gly Phe Asp
50 55 60

His Lys Gly Leu Ile Asp Ala Ala Lys Ala Gln Tyr Glu Arg Phe Pro
65 70 75 80

Gly Tyr His Ala Phe Ser Gly Arg Met Ser Asp Gln Thr Val Met Leu
85 90 95

Ser Glu Lys Leu Val Glu Val Ser Pro Phe Asp Ser Gly Arg Val Phe
100 105 110

Tyr Thr Asn Ser Gly Ser Glu Ala Asn Asp Thr Met Val Lys Met Leu
115 120 125

Trp Phe Leu His Ala Ala Glu Gly Lys Pro Gln Lys Arg Lys Ile Leu
130 135 140

Thr Arg Trp Asn Ala Tyr His Gly Ala Thr Ala Val Ser Ala Ser Met
145 150 155 160

Thr Gly Lys Pro Tyr Asn Ser Val Phe Gly Leu Pro Leu Pro Gly Phe
165 170 175

Leu His Leu Thr Cys Pro His Tyr Trp Arg Tyr Gly Glu Glu Gly Glu
180 185 190

Thr Glu Glu Gln Phe Val Ala Arg Leu Ala Arg Glu Leu Glu Glu Thr
195 200 205

CX2-126USP1_ST25

Ile Gln Lys Glu Gly Ala Asp Thr Ile Ala Gly Phe Phe Ala Glu Pro
210 215 220

Val Met Gly Ala Gly Gly Val Ile Pro Pro Ala Lys Gly Tyr Phe Gln
225 230 235 240

Ala Ile Leu Pro Ile Leu Arg Lys Tyr Asp Ile Pro Val Ile Ser Asp
245 250 255

Glu Val Ile Cys Gly Phe Gly Arg Thr Gly Asn Thr Trp Gly Cys Val
260 265 270

Thr Tyr Asp Phe Thr Pro Asp Ala Ile Ile Ser Ser Lys Asn Leu Thr
275 280 285

Ala Gly Phe Phe Pro Val Gly Ala Val Ile Leu Gly Pro Glu Leu Ser
290 295 300

Lys Arg Leu Glu Thr Ala Ile Glu Ala Ile Glu Glu Phe Pro His Gly
305 310 315 320

Phe Thr Ala Gly Gly His Pro Val Gly Cys Ala Ile Ala Leu Lys Ala
325 330 335

Ile Asp Val Val Met Asn Glu Gly Leu Ala Glu Asn Val Arg Arg Leu
340 345 350

Ala Pro Arg Phe Glu Glu Arg Leu Lys His Ile Ala Glu Arg Pro Asn
355 360 365

Ile Gly Glu Tyr Arg Gly Ile Gly Phe Met Trp Ala Leu Glu Ala Val
370 375 380

Lys Asp Lys Ala Ser Lys Ala Pro Phe Asp Gly Asn Leu Ser Val Ser
385 390 395 400

Glu Arg Ile Ala Asn Thr Cys Thr Asp Leu Gly Leu Ile Cys Arg Pro
405 410 415

Leu Gly Gln Ser Val Val Leu Cys Pro Pro Phe Ile Leu Thr Glu Ala
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Gln Met Asp Glu Met Phe Asp Lys Leu Glu Lys Ala Leu Asp Lys Val
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Phe Ala Glu Val Ala
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<210> 3
<211> 1359
<212> DNA
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CX2-126USP1_ST25

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<223> Engineered variant of *V. fluvialis* transaminase

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<211> 453

<212> PRT

<213> Artificial Sequence

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<223> Engineered variant of *V. fluvialis* transaminase

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CX2-126USP1_ST25

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 Tyr Leu Asp Ala Asn Ser Gly Ala Leu Asn Met Val Ala Gly Phe Asp
 50 55 60
 His Lys Gly Leu Ile Asp Ala Ala Lys Ala Gln Tyr Glu Arg Phe Pro
 65 70 75 80
 Gly Tyr His Ala Phe Ser Gly His Met Ser Asp Gln Thr Val Met Leu
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 Ser Glu Lys Leu Val Glu Val Ser Pro Phe Asp Ser Gly Arg Val Phe
 100 105 110
 Tyr Thr Asn Ser Gly Ser Glu Ala Asn Asp Thr Met Val Lys Met Leu
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 Trp Phe Leu His Ala Ala Glu Gly Lys Pro Gln Lys Arg Lys Ile Leu
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 Thr Arg Trp Asn Ala Tyr His Gly Cys Thr Val Val Ser Ala Ser Met
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 Thr Gly Phe Pro Tyr Asn Ser Val Phe Gly Leu Pro Leu Pro Gly Phe
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 Leu His Leu Thr Cys Pro His Tyr Trp Arg Tyr Gly Glu Glu Gly Glu
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 Thr Glu Glu Gln Phe Val Ala Arg Leu Ala Arg Glu Leu Glu Glu Thr
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 Ile Gln Lys Glu Gly Ala Asp Thr Ile Ala Gly Phe Phe Ala Glu Pro
 210 215 220
 Val Met Gly Ala Gly Gly Val Ile Pro Pro Ala Lys Gly Tyr Phe Gln
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 Ala Ile Leu Pro Ile Leu Arg Lys Tyr Asp Ile Pro Val Ile Ser Asp
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 Glu Val Ile Cys Gly Phe Gly Arg Thr Gly Asn Thr Trp Gly Cys Val
 260 265 270
 Thr Tyr Asp Phe Thr Pro Asp Ala Ile Ile Ser Ser Lys Asn Leu Thr
 275 280 285
 Ala Gly Phe Phe Pro Val Gly Ala Val Ile Leu Gly Pro Glu Leu Ser
 290 295 300

CX2-126USP1_ST25

Lys Arg Leu Glu Thr Ala Ile Glu Ala Ile Gly Glu Phe Pro His Gly
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Phe Thr Ala Gly Gly His Pro Val Gly Cys Ala Ile Ala Leu Lys Ala
325 330 335

Ile Asp Val Val Met Asn Glu Gly Leu Ala Glu Asn Val Arg Arg Leu
340 345 350

Ala Pro Arg Phe Glu Glu Arg Leu Lys His Ile Ala Glu Arg Pro Asn
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Ile Gly Glu Tyr Arg Gly Ile Gly Phe Met Trp Ala Leu Glu Ala Val
370 375 380

Lys Asp Lys Ala Ser Lys Ala Pro Phe Asp Gly Asn Leu Ser Val Ser
385 390 395 400

Glu Arg Ile Ala Asn Thr Cys Thr Asp Leu Gly Leu Ile Cys Arg Pro
405 410 415

Thr Gly Gln Ser Val Val Leu Cys Pro Pro Phe Ile Leu Thr Glu Ala
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Gln Met Asp Glu Met Phe Asp Lys Leu Glu Lys Ala Leu Asp Lys Val
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Phe Ala Glu Val Ala
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<213> Artificial Sequence

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<223> Engineered variant of V. fluvialis transaminase

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CX2-126USP1_ST25

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 <223> Engineered variant of V. fluvialis transaminase

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Tyr Gly Phe Thr Asp Met Pro Ser Leu His Gln Arg Gly Thr Val Val
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Val Ala His Gly Glu Gly Pro Tyr Ile Val Asp Val His Gly Arg Arg
 35 40 45

Tyr Leu Asp Ala Met Ser Gly Ala Leu Asn Met Val Ala Gly Phe Asp
 50 55 60

His Lys Gly Leu Ile Asp Ala Ala Lys Ala Gln Tyr Glu Arg Phe Pro
 65 70 75 80

Gly Tyr His Ala Phe Cys Gly Tyr Met Ser Asp Gln Thr Val Met Leu
 85 90 95

Ser Glu Lys Leu Val Glu Val Ser Pro Phe Asp Ser Gly Arg Val Phe
 100 105 110

Tyr Thr Asn Ser Gly Ser Glu Ala Asn Asp Thr Met Val Lys Met Leu
 115 120 125
 Trp Phe Leu His Ala Ala Glu Gly Lys Pro Gln Lys Arg Lys Ile Leu
 130 135 140
 Thr Leu Trp Asn Ala Tyr His Gly Cys Thr Val Val Ser Ala Ser Met
 145 150 155 160
 Thr Gly Phe Pro Phe Asn Ser Val Phe Gly Leu Pro Leu Pro Gly Phe
 165 170 175
 Leu His Leu Thr Cys Pro His Tyr Trp Arg Tyr Gly Glu Glu Gly Glu
 180 185 190
 Thr Glu Glu Gln Phe Val Ala Arg Leu Ala Arg Glu Leu Glu Glu Thr
 195 200 205
 Ile Gln Lys Glu Gly Ala Asp Thr Ile Ala Gly Phe Phe Ala Glu Pro
 210 215 220
 Val Met Gly Ala Gly Gly Val Ile Pro Pro Ala Lys Gly Tyr Phe Gln
 225 230 235 240
 Ala Ile Leu Pro Ile Leu Arg Lys Tyr Asp Ile Pro Val Ile Ser Asp
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 Glu Val Ile Cys Gly Phe Gly Arg Thr Gly Asn Thr Trp Gly Cys Val
 260 265 270
 Thr Tyr Asp Phe Thr Pro Asp Ala Ile Ile Ser Ser Lys Asn Leu Thr
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 Ala Gly Phe Phe Pro Val Gly Ala Val Ile Leu Gly Pro Glu Leu Ser
 290 295 300
 Lys Arg Leu Glu Thr Ala Ile Glu Ala Ile Gly Glu Phe Pro His Gly
 305 310 315 320
 Phe Thr Ala Gly Gly His Pro Val Gly Cys Ala Ile Ala Leu Lys Ala
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 Ile Asp Val Val Met Asn Glu Gly Leu Ala Glu Asn Val Arg Arg Leu
 340 345 350
 Ala Pro Arg Phe Glu Glu Arg Leu Lys His Ile Ala Glu His Pro Asn
 355 360 365
 Ile Gly Glu Tyr Arg Gly Ile Gly Phe Met Trp Ala Leu Glu Val Val
 370 375 380

CX2-126USP1_ST25

Lys Asp Lys Ala Ser Lys Ala Pro Phe Asp Gly Asn Leu Ser Val Ser
385 390 395 400

Glu Arg Ile Ala Asn Thr Cys Thr Asp Leu Gly Leu Ile Cys Arg Pro
405 410 415

Thr Gly Gln Ser Val Val Leu Cys Pro Pro Phe Ile Leu Thr Glu Ala
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Gln Met Asp Glu Met Phe Asp Lys Leu Glu Lys Ala Leu Asp Lys Val
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Phe Ala Glu Val Ala
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CX2-126USP1_ST25

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Tyr Gly Phe Thr Asp Met Pro Ser Leu His Gln Arg Gly Thr Val Val
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Val Ala His Gly Glu Gly Pro Tyr Ile Val Asp Val His Gly Arg Arg
35 40 45

Tyr Leu Asp Ala Met Ser Gly Ala Leu Asn Met Val Ala Gly Phe Asp
50 55 60

His Lys Gly Leu Ile Asp Ala Ala Lys Ala Gln Tyr Glu Arg Phe Pro
65 70 75 80

Gly Tyr His Ala Phe Cys Gly Tyr Met Ser Asp Gln Thr Val Met Leu
85 90 95

Ser Glu Lys Leu Val Glu Val Ser Pro Phe Asp Ser Gly Arg Val Phe
100 105 110

Tyr Thr Asn Ser Gly Ser Glu Ala Asn Asp Thr Met Val Lys Met Leu
115 120 125

Trp Phe Leu His Ala Ala Glu Gly Lys Pro Gln Lys Arg Lys Ile Leu
130 135 140

Thr Leu Trp Asn Ala Tyr His Gly Cys Thr Val Val Ser Ala Ser Met
145 150 155 160

Thr Gly Phe Pro Phe Asn Ser Val Phe Gly Leu Pro Leu Pro Gly Phe
165 170 175

Leu His Leu Thr Cys Pro His Tyr Trp Arg Tyr Gly Glu Glu Gly Glu
180 185 190

Thr Glu Glu Gln Phe Val Ala Arg Leu Ala Arg Glu Leu Glu Glu Thr
195 200 205

CX2-126USP1_ST25

Ile Gln Lys Glu Gly Ala Asp Thr Ile Ala Gly Phe Phe Ala Glu Pro
210 215 220

Val Met Gly Gly Gly Gly Val Ile Pro Pro Ala Lys Gly Tyr Phe Gln
225 230 235 240

Ala Ile Leu Pro Ile Leu Arg Lys Tyr Asp Ile Pro Val Ile Ser Asp
245 250 255

Glu Val Val Cys Gly Phe Gly Arg Thr Gly Asn Thr Trp Gly Cys Val
260 265 270

Thr Tyr Asp Phe Thr Pro Asp Ala Ile Ile Ser Ser Lys Asn Leu Thr
275 280 285

Ala Gly Phe Phe Pro Val Gly Ala Val Ile Leu Gly Pro Glu Leu Ser
290 295 300

Lys Arg Leu Glu Thr Ala Ile Glu Ala Ile Gly Glu Phe Pro His Gly
305 310 315 320

Phe Thr Ala Gly Gly His Pro Val Gly Cys Ala Ile Ala Leu Lys Ala
325 330 335

Ile Asp Val Val Met Asn Glu Gly Leu Ala Glu Asn Val Arg Arg Leu
340 345 350

Ala Pro Arg Phe Glu Glu Arg Leu Lys His Ile Ala Glu His Pro Asn
355 360 365

Ile Gly Glu Tyr Arg Gly Ile Gly Phe Met Trp Ala Leu Glu Val Val
370 375 380

Lys Asp Lys Ala Ser Lys Ala Pro Phe Asp Gly Asn Leu Ser Val Ser
385 390 395 400

Glu Arg Ile Ala Asn Thr Cys Thr Asp Leu Gly Leu Ile Cys Arg Pro
405 410 415

Thr Gly Gln Ser Val Val Leu Cys Pro Pro Phe Ile Leu Thr Glu Ala
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Gln Met Asp Glu Met Phe Asp Lys Leu Glu Lys Ala Leu Asp Lys Val
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Phe Ala Glu Val Ala
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<210> 9
<211> 1359

CX2-126USP1_ST25

<212> DNA

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<223> Engineered variant of V. fluvialis transaminase

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<213> Artificial Sequence

<220>

<223> Engineered variant of V. fluvialis transaminase

<400> 10

Met	Asn	Lys	Pro	Gln	Ser	Trp	Glu	Thr	Arg	Ala	Glu	Thr	Tyr	Ser	Leu
1				5					10					15	

Tyr Gly Phe Thr Asp Met Pro Ser Leu His Gln Arg Gly Thr Val Val
 20 30
 Val Ala His Gly Glu Gly Pro Tyr Ile Val Asp Val His Gly Arg Arg
 35 40 45
 Tyr Leu Asp Ala Met Ser Gly Ala Leu Asn Met Val Ala Gly Phe Asp
 50 55 60
 His Lys Gly Leu Ile Asp Ala Ala Lys Ala Gln Tyr Glu Arg Phe Pro
 65 70 75 80
 Gly Tyr His Ala Phe Cys Gly Tyr Met Ser Asp Gln Thr Val Met Leu
 85 90 95
 Ser Glu Lys Leu Val Glu Val Ser Pro Phe Asp Ser Gly Arg Val Phe
 100 105 110
 Tyr Thr Asn Ser Gly Ser Glu Ala Asn Asp Thr Met Val Lys Met Leu
 115 120 125
 Trp Phe Leu His Ala Ala Glu Gly Lys Pro Gln Lys Arg Lys Ile Leu
 130 135 140
 Thr Leu Trp Asn Ala Tyr His Gly Cys Thr Val Val Ser Ala Ser Met
 145 150 155 160
 Thr Gly Phe Pro Phe Asn Ser Val Phe Gly Leu Pro Leu Pro Gly Phe
 165 170 175
 Leu His Leu Thr Cys Pro His Tyr Trp Arg Tyr Gly Glu Glu Gly Glu
 180 185 190
 Thr Glu Glu Gln Phe Val Ala Arg Leu Ala Arg Glu Leu Glu Glu Thr
 195 200 205
 Ile Gln Lys Glu Gly Ala Asp Thr Ile Ala Gly Phe Phe Ala Glu Pro
 210 215 220
 Val Met Gly Ala Gly Gly Val Ile Pro Pro Ala Lys Gly Tyr Phe Gln
 225 230 235 240
 Ala Ile Leu Pro Ile Leu Arg Lys Tyr Asp Ile Pro Val Ile Ser Asp
 245 250 255
 Glu Val Val Cys Gly Phe Gly Arg Thr Gly Asn Thr Trp Gly Cys Val
 260 265 270
 Thr Tyr Asp Phe Thr Pro Asp Ala Ile Ile Ser Ser Lys Asn Leu Thr
 275 280 285

CX2-126USP1_ST25

Ala Gly Phe Phe Pro Val Gly Ala Val Ile Leu Gly Pro Glu Leu Ser
290 295 300

Lys Arg Leu Glu Thr Ala Ile Glu Ala Ile Gly Glu Phe Pro His Gly
305 310 315 320

Phe Thr Ala Gly Gly His Pro Val Gly Cys Ala Ile Ala Leu Lys Ala
325 330 335

Ile Asp Val Val Met Asn Glu Gly Leu Ala Glu Asn Val Arg Arg Leu
340 345 350

Ala Pro Arg Phe Glu Glu Arg Leu Lys His Ile Ala Glu His Pro Asn
355 360 365

Ile Gly Glu Tyr Arg Gly Ile Gly Phe Met Trp Ala Leu Glu Val Val
370 375 380

Lys Asp Lys Ala Ser Lys Ala Pro Phe Asp Gly Asn Leu Ser Val Ser
385 390 395 400

Glu Arg Ile Ala Asn Thr Cys Thr Asp Leu Gly Leu Ile Cys Ala Pro
405 410 415

Thr Gly Gln Ser Val Val Leu Cys Pro Pro Phe Ile Leu Thr Glu Ala
420 425 430

Gln Met Asp Glu Met Phe Asp Lys Leu Glu Lys Ala Leu Asp Lys Val
435 440 445

Phe Ala Glu Val Ala
450

<210> 11
<211> 1359
<212> DNA
<213> Artificial sequence

<220>
<223> Engineered variant of V. fluvialis transaminase

<400> 11
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gatatgccga gcctgcatca gcgtggcacc gtggtggtgg cccatggcga aggcccgtat 120
atcgtggatg tgcattggccg tcgttatctg gatgcgatga gcggcgcttt gaacatggtg 180
gcgggctttg atcataaagg cctgattgat gcggcgaaaag cgcagtatga acgttttccg 240
ggctatcatg cgttttgcgg ctatatgagc gatcagaccg tgatgctgtc tgaaaaactg 300
gtggaagtga gcccgtttga tagcggccgt gtgttttata ccaacagcgg cagcgaagcg 360
aacgatacca tgggtgaaaat gctgtggttt ctgcatgcgg cggaaggcaa accgcagaaa 420
cgtaaaattc tgaccctgtg gaacgcgtat catggctgca ccgtagtgag cgcgagcatg 480

CX2-126USP1_ST25

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accggctttc cgttcaacag cgtgtttggc ctgccgctgc cgggctttct gcatctgacc      540
tgcccgcatt attggcggtta tggcgaagaa ggcgaaaccg aagaacagtt tgtcgcgcgt      600
ctggcccgtg aactggaaga aaccattcag aaggaaggcg cggataccat tgcgggcttt      660
tttgcggaac cggatgatggg tgctggcggg gttattccgc cggcgaaagg ctattttcag      720
gcgattctgc cgatcctgcg caaatatgat attccgggtga tcagcgatga agtggtgtgc      780
ggctttggcc gtaccggtaa cacctggggc tgcgtgacct atgattttac cccggatgcg      840
attattagca gtaaaaacct aaccgcgggt ttttttccgg taggcgcggg gattctgggt      900
ccggaactga gcaaactgtt ggaaaccgcg attgaagcga tcggcgaatt tccgcatggt      960
tttaccgcgg gcggccatcc ggtgggttgt gcgattgcgc tgaaagcgat tgatgtggtg     1020
atgaacgaag gcctggccga aaacgtgcgt cgtctggccc cgcgttttga agaactctg      1080
aaacatatgg cggaaactcc gaacattggc gaatatcgtg gcattggctt tatgtgggcg      1140
ctggaagtgg tgaaagataa agcgagcaaa gccccgtttg atggcaacct gagcgtgagc      1200
gaacgtattg cgaacacctg caccgatctg ggcctgattt gcgctccgac aggccagagc      1260
gtggtttctg gcccgcggtt cattctgacc gaagcgcaga tggatgaaat gttcgataaa      1320
ctggaaaaag cgctggataa agtgtttgcg gaagtggcg                                1359

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<210> 12
 <211> 453
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> Engineered variant of *V. fluvialis* transaminase
 <400> 12

Met Asn Lys Pro Gln Ser Trp Glu Thr Arg Ala Glu Thr Tyr Ser Leu
 1 5 10 15

Tyr Gly Phe Thr Asp Met Pro Ser Leu His Gln Arg Gly Thr Val Val
 20 25 30

Val Ala His Gly Glu Gly Pro Tyr Ile Val Asp Val His Gly Arg Arg
 35 40 45

Tyr Leu Asp Ala Met Ser Gly Ala Leu Asn Met Val Ala Gly Phe Asp
 50 55 60

His Lys Gly Leu Ile Asp Ala Ala Lys Ala Gln Tyr Glu Arg Phe Pro
 65 70 75 80

Gly Tyr His Ala Phe Cys Gly Tyr Met Ser Asp Gln Thr Val Met Leu
 85 90 95

Ser Glu Lys Leu Val Glu Val Ser Pro Phe Asp Ser Gly Arg Val Phe
 100 105 110

CX2-126USP1_ST25

Tyr Thr Asn Ser Gly Ser Glu Ala Asn Asp Thr Met Val Lys Met Leu
 115 120 125
 Trp Phe Leu His Ala Ala Glu Gly Lys Pro Gln Lys Arg Lys Ile Leu
 130 135 140
 Thr Leu Trp Asn Ala Tyr His Gly Cys Thr Val Val Ser Ala Ser Met
 145 150 155 160
 Thr Gly Phe Pro Phe Asn Ser Val Phe Gly Leu Pro Leu Pro Gly Phe
 165 170 175
 Leu His Leu Thr Cys Pro His Tyr Trp Arg Tyr Gly Glu Glu Gly Glu
 180 185 190
 Thr Glu Glu Gln Phe Val Ala Arg Leu Ala Arg Glu Leu Glu Glu Thr
 195 200 205
 Ile Gln Lys Glu Gly Ala Asp Thr Ile Ala Gly Phe Phe Ala Glu Pro
 210 215 220
 Val Met Gly Ala Gly Gly Val Ile Pro Pro Ala Lys Gly Tyr Phe Gln
 225 230 235 240
 Ala Ile Leu Pro Ile Leu Arg Lys Tyr Asp Ile Pro Val Ile Ser Asp
 245 250 255
 Glu Val Val Cys Gly Phe Gly Arg Thr Gly Asn Thr Trp Gly Cys Val
 260 265 270
 Thr Tyr Asp Phe Thr Pro Asp Ala Ile Ile Ser Ser Lys Asn Leu Thr
 275 280 285
 Ala Gly Phe Phe Pro Val Gly Ala Val Ile Leu Gly Pro Glu Leu Ser
 290 295 300
 Lys Arg Leu Glu Thr Ala Ile Glu Ala Ile Gly Glu Phe Pro His Gly
 305 310 315 320
 Phe Thr Ala Gly Gly His Pro Val Gly Cys Ala Ile Ala Leu Lys Ala
 325 330 335
 Ile Asp Val Val Met Asn Glu Gly Leu Ala Glu Asn Val Arg Arg Leu
 340 345 350
 Ala Pro Arg Phe Glu Glu Arg Leu Lys His Ile Ala Glu Arg Pro Asn
 355 360 365
 Ile Gly Glu Tyr Arg Gly Ile Gly Phe Met Trp Ala Leu Glu Val Val
 370 375 380

CX2-126USP1_ST25

Lys Asp Lys Ala Ser Lys Ala Pro Phe Asp Gly Asn Leu Ser Val Ser
385 390 395 400

Glu Arg Ile Ala Asn Thr Cys Thr Asp Leu Gly Leu Ile Cys Ala Pro
405 410 415

Thr Gly Gln Ser Val Val Leu Cys Pro Pro Phe Ile Leu Thr Glu Ala
420 425 430

Gln Met Asp Glu Met Phe Asp Lys Leu Glu Lys Ala Leu Asp Lys Val
435 440 445

Phe Ala Glu Val Ala
450

<210> 13
<211> 1359
<212> DNA
<213> Artificial Sequence

<220>
<223> Engineered variant of *V. fluvialis* transaminase

<400> 13
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gatatgccga gcctgcatca gcgtggcacc gtggtggtgg cccatggcga aggcccgat 120
atcgtggatg tgcattggccg tcgttatctg gatgcgatga gcggcgcttt gaacatgggtg 180
gcgggctttg atcataaagg cctgattgat gcggcgaaag cgcagtatga acgttttccg 240
ggctatcatg cgttttgctg ctatatgagc gatcagaccg tgatgctgtc tgaaaaactg 300
gtggaagtga gcccgtttga tagcggccgt gtgttttata ccaacagcgg cagcgaagcg 360
aacgatacca tgggtgaaaat gctgtggttt ctgcatgcgg cggaaggcaa accgcagaaa 420
cgtaaaattc tgaccctgtg gaacgcgtat catggctgca ccgtagtgag cgcgagcatg 480
accggctttc cgttcaacag cgtgtttggc ctgccgctgc cgggctttct gcatctgacc 540
tgcccgcatc attggcggtt tggcgaagaa ggcgaaaccg aagaacagtt tgcgcgcgt 600
ctggcccgtg aactggaaga aaccattcag aagggaaggc cgataccat tgcgggcttt 660
tttgcggaac cgggtgatggg tggcggcggg gttattccgc cggcgaaagg ctattttcag 720
gcgattctgc cgatcctgcg caaatatgat attccgggtg tcagcgatga agtgggtgtgc 780
ggctttggcc gtaccggtta cacctggggc tgcgtgacct atgattttac cccggatgcg 840
attattagca gtaaaaacct aaccgcgggt ttttttccgg taggcgcggg gattctgggt 900
ccggaactga gcaaactgtt ggaaaccgcg attgaagcga tcggcgaatt tccgcatggt 960
tttaccgcgg gcggccatcc ggtgggttgt gcgattgcgc tgaaagcgat tgatgtgggt 1020
atgaacgaag gcctggccga aaacgtgcgt cgtctggccc cgcgttttga agaactctg 1080
aaacatatgt cggaacatcc gaacattggc gaatatcgtg gcattggctt tatgtgggcg 1140

CX2-126USP1_ST25

ctggaagttg tgaagataa agcgagcaaa gccccgtttg atggcaacct gagcgtgagc 1200
 gaacgtattg cgaacacctg caccgatctg ggcttgattt gcgttccgac aggccagagc 1260
 gtggttctgt gcccgccgtt cattctgacc gaagcgcaga tggatgaaat gttcgataaa 1320
 ctggaaaaag cgctggataa agtgtttgcg gaagtggcg 1359

<210> 14
 <211> 453
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> Engineered variant of V. fluvialis transaminase

<400> 14

Met Asn Lys Pro Gln Ser Trp Glu Thr Arg Ala Glu Thr Tyr Ser Leu
 1 5 10 15

Tyr Gly Phe Thr Asp Met Pro Ser Leu His Gln Arg Gly Thr Val Val
 20 25 30

Val Ala His Gly Glu Gly Pro Tyr Ile Val Asp Val His Gly Arg Arg
 35 40 45

Tyr Leu Asp Ala Met Ser Gly Ala Leu Asn Met Val Ala Gly Phe Asp
 50 55 60

His Lys Gly Leu Ile Asp Ala Ala Lys Ala Gln Tyr Glu Arg Phe Pro
 65 70 75 80

Gly Tyr His Ala Phe Cys Gly Tyr Met Ser Asp Gln Thr Val Met Leu
 85 90 95

Ser Glu Lys Leu Val Glu Val Ser Pro Phe Asp Ser Gly Arg Val Phe
 100 105 110

Tyr Thr Asn Ser Gly Ser Glu Ala Asn Asp Thr Met Val Lys Met Leu
 115 120 125

Trp Phe Leu His Ala Ala Glu Gly Lys Pro Gln Lys Arg Lys Ile Leu
 130 135 140

Thr Leu Trp Asn Ala Tyr His Gly Cys Thr Val Val Ser Ala Ser Met
 145 150 155 160

Thr Gly Phe Pro Phe Asn Ser Val Phe Gly Leu Pro Leu Pro Gly Phe
 165 170 175

Leu His Leu Thr Cys Pro His Tyr Trp Arg Tyr Gly Glu Glu Gly Glu
 180 185 190

CX2-126USP1_ST25

Thr Glu Glu Gln Phe Val Ala Arg Leu Ala Arg Glu Leu Glu Glu Thr
195 200 205

Ile Gln Lys Glu Gly Ala Asp Thr Ile Ala Gly Phe Phe Ala Glu Pro
210 215 220

Val Met Gly Gly Gly Gly Val Ile Pro Pro Ala Lys Gly Tyr Phe Gln
225 230 235 240

Ala Ile Leu Pro Ile Leu Arg Lys Tyr Asp Ile Pro Val Ile Ser Asp
245 250 255

Glu Val Val Cys Gly Phe Gly Arg Thr Gly Asn Thr Trp Gly Cys Val
260 265 270

Thr Tyr Asp Phe Thr Pro Asp Ala Ile Ile Ser Ser Lys Asn Leu Thr
275 280 285

Ala Gly Phe Phe Pro Val Gly Ala Val Ile Leu Gly Pro Glu Leu Ser
290 295 300

Lys Arg Leu Glu Thr Ala Ile Glu Ala Ile Gly Glu Phe Pro His Gly
305 310 315 320

Phe Thr Ala Gly Gly His Pro Val Gly Cys Ala Ile Ala Leu Lys Ala
325 330 335

Ile Asp Val Val Met Asn Glu Gly Leu Ala Glu Asn Val Arg Arg Leu
340 345 350

Ala Pro Arg Phe Glu Glu Arg Leu Lys His Ile Ala Glu His Pro Asn
355 360 365

Ile Gly Glu Tyr Arg Gly Ile Gly Phe Met Trp Ala Leu Glu Val Val
370 375 380

Lys Asp Lys Ala Ser Lys Ala Pro Phe Asp Gly Asn Leu Ser Val Ser
385 390 395 400

Glu Arg Ile Ala Asn Thr Cys Thr Asp Leu Gly Leu Ile Cys Val Pro
405 410 415

Thr Gly Gln Ser Val Val Leu Cys Pro Pro Phe Ile Leu Thr Glu Ala
420 425 430

Gln Met Asp Glu Met Phe Asp Lys Leu Glu Lys Ala Leu Asp Lys Val
435 440 445

Phe Ala Glu Val Ala
450

CX2-126USP1_ST25

<210> 15
 <211> 1359
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Engineered variant of *V. fluvialis* transaminase

<400> 15
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 gatatgccga gcctgcatca gcgtggcacc gtggtggtgg cccatggcga agggccgtat 120
 atcgtggatg tgcattggcg tcgttatctg gatgcgatga gcggcgcttt gaacatggtg 180
 gcgggctttg atcataaagg cctgattgat gcggcgaaaag cgagatgata acgtttttccg 240
 ggctatcatg cgtttttgcg ctatatgagc gatcagaccg tgatgctgtc tgaaaaactg 300
 gtggaagtga gcccgtttga tagcggccgt gtgttttata ccaacagcgg cagcgaagcg 360
 aacgatacca tgggtgaaaat gctgtggttt ctgcatgcgg cggaaggcaa accgcagaaa 420
 cgtaaaattc tgaccctgtg gaacgcgtat catggctgca ccgtagtgag cgcgagcatg 480
 accggctttc cgttcaacag cgtgtttggc ctgccgctgc cgggctttct gcatctgacc 540
 tgcccgcatc attggcggtt tggcgaagaa ggcgaaaccg aagaacagtt tgtcgcgcgt 600
 ctggcccgtg aactggaaga aaccattcag aagggaaggcg cggataccat tgcgggcttt 660
 tttgcggaac cgggtgatggg tggcggcggg gttattccgc cggcgaaagg ctattttcag 720
 gcgattctgc cgatcctgcg caaatatgat attccgggtg tcagcgatga agtgggtgtgc 780
 ggctttggcc gtaccggtaa cacctggggc tgcgtgacct atgattttac cccggatgcg 840
 attattagca gtaaaaacct aaccgcgggt ttttttccgg taggcgcggg gattctgggt 900
 ccggaactga gcaaactctt ggaaaccgcg attgaagcga tcggcggaatt tccgcatggt 960
 tttaccgcgg gcggccatcc ggtgggttgt gcgattgcgc tgaaagcgat tgatgtggtg 1020
 atgaacgaag gcctggccga aaacgtgcgt cgtctggccc cgcgttttga agaactctg 1080
 aaacatattg cgggaacatcc gaacattggc gaatatctg gcattggctt tatgtgggcg 1140
 ctggaagtgt tgaaagataa agcgagcaaa gccccgtttg atggcaacct gagcgtgagc 1200
 gaacgtattg cgaacacctg caccgatctg ggcctgattt gcgctccgac aggccagagc 1260
 gtggttctgt gcccgcggtt cattctgacc gaagcgcaga tggatgaaat gttcgataaa 1320
 ctggaaaaag cgctggataa agtgtttgcg gaagtggcg 1359

<210> 16
 <211> 453
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> Engineered variant of *V. fluvialis* transaminase

<400> 16

Met Asn Lys Pro Gln Ser Trp Glu Thr Arg Ala Glu Thr Tyr Ser Leu
 1 5 10 15

CX2-126USP1_ST25

Tyr Gly Phe Thr Asp Met Pro Ser Leu His Gln Arg Gly Thr Val Val
 20 25 30
 Val Ala His Gly Glu Gly Pro Tyr Ile Val Asp Val His Gly Arg Arg
 35 40 45
 Tyr Leu Asp Ala Met Ser Gly Ala Leu Asn Met Val Ala Gly Phe Asp
 50 55 60
 His Lys Gly Leu Ile Asp Ala Ala Lys Ala Gln Tyr Glu Arg Phe Pro
 65 70 75 80
 Gly Tyr His Ala Phe Cys Gly Tyr Met Ser Asp Gln Thr Val Met Leu
 85 90 95
 Ser Glu Lys Leu Val Glu Val Ser Pro Phe Asp Ser Gly Arg Val Phe
 100 105 110
 Tyr Thr Asn Ser Gly Ser Glu Ala Asn Asp Thr Met Val Lys Met Leu
 115 120 125
 Trp Phe Leu His Ala Ala Glu Gly Lys Pro Gln Lys Arg Lys Ile Leu
 130 135 140
 Thr Leu Trp Asn Ala Tyr His Gly Cys Thr Val Val Ser Ala Ser Met
 145 150 155 160
 Thr Gly Phe Pro Phe Asn Ser Val Phe Gly Leu Pro Leu Pro Gly Phe
 165 170 175
 Leu His Leu Thr Cys Pro His Tyr Trp Arg Tyr Gly Glu Glu Gly Glu
 180 185 190
 Thr Glu Glu Gln Phe Val Ala Arg Leu Ala Arg Glu Leu Glu Glu Thr
 195 200 205
 Ile Gln Lys Glu Gly Ala Asp Thr Ile Ala Gly Phe Phe Ala Glu Pro
 210 215 220
 Val Met Gly Gly Gly Gly Val Ile Pro Pro Ala Lys Gly Tyr Phe Gln
 225 230 235 240
 Ala Ile Leu Pro Ile Leu Arg Lys Tyr Asp Ile Pro Val Ile Ser Asp
 245 250 255
 Glu Val Val Cys Gly Phe Gly Arg Thr Gly Asn Thr Trp Gly Cys Val
 260 265 270
 Thr Tyr Asp Phe Thr Pro Asp Ala Ile Ile Ser Ser Lys Asn Leu Thr
 275 280 285

CX2-126USP1_ST25

Ala Gly Phe Phe Pro Val Gly Ala Val Ile Leu Gly Pro Glu Leu Ser
290 295 300

Lys Arg Leu Glu Thr Ala Ile Glu Ala Ile Gly Glu Phe Pro His Gly
305 310 315 320

Phe Thr Ala Gly Gly His Pro Val Gly Cys Ala Ile Ala Leu Lys Ala
325 330 335

Ile Asp Val Val Met Asn Glu Gly Leu Ala Glu Asn Val Arg Arg Leu
340 345 350

Ala Pro Arg Phe Glu Glu Arg Leu Lys His Ile Ala Glu His Pro Asn
355 360 365

Ile Gly Glu Tyr Arg Gly Ile Gly Phe Met Trp Ala Leu Glu Val Val
370 375 380

Lys Asp Lys Ala Ser Lys Ala Pro Phe Asp Gly Asn Leu Ser Val Ser
385 390 395 400

Glu Arg Ile Ala Asn Thr Cys Thr Asp Leu Gly Leu Ile Cys Ala Pro
405 410 415

Thr Gly Gln Ser Val Val Leu Cys Pro Pro Phe Ile Leu Thr Glu Ala
420 425 430

Gln Met Asp Glu Met Phe Asp Lys Leu Glu Lys Ala Leu Asp Lys Val
435 440 445

Phe Ala Glu Val Ala
450

<210> 17
<211> 1359
<212> DNA
<213> Artificial Sequence

<220>
<223> Engineered variant of v. fluvialis transaminase

<400> 17
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atcgtggatg tgcattggcg tcgttatctg gatgcgatga gcggcgcttt gaacatggtg 180
gcgggctttg atcataaagg cctgattgat gcggcgaaaag cgcagtatga acgttttccg 240
ggctatcatg cgttttgcgg ctatatgagc gatcagaccg tgatgctgtc tgaaaaactg 300
gtggaagtga gcccgtttga tagcggccgt gtgttttata ccaacagcgg cagcgaagcg 360
aacgatacca tggtgaaaat gctgtggttt ctgcatgcgg cggaaggcaa accgcagaaa 420

CX2-126USP1_ST25

cgtaaaattc tgacctgtg gaacgcgtat catggctgca ccgtagtgag cgcgagcatg 480
 accggctttc cgttcaacag cgtgtttggc ctgccgctgc cgggctttct gcatctgacc 540
 tgcccgcatt attggcgta tggcgaagaa ggcgaaaccg aagaacagtt tgtcgcgcgt 600
 ctggcccgtg aactggaaga aaccattcag aaggaaggcg cggataccat tgcgggcttt 660
 tttgcggaac cggatgatggg tgctggcggg gttattccgc cggcgaaagg ctattttcag 720
 gcgattctgc cgatcctgcg caaatatgat attccgggtga tcagcgatga agtggtgtgc 780
 ggctttggcc gtaccggtaa cacctggggc tgcgtgacct atgattttac cccggatgcg 840
 attattagca gtaaaaacct aaccgcgggt ttttttccgg taggcgcggg gattctgggt 900
 ccggaactga gcaaactgtt ggaaaccgcg attgaagcga tcggcgaatt tccgcatggg 960
 tttaccgcgg gcggccatcc ggtgggttgt gcgattgcgc tgaaagcgat tgatgtggtg 1020
 atgaacgaag gcctggccga aaacgtgcgt cgtctggccc cgcgttttga agaactgtg 1080
 aaacatattg cggaacatcc gaacattggc gaatatcgtg gcattggctt tatgtgggcg 1140
 ctggaagttg tgaaagataa agcgagcaaa gccccgtttg atggcaacct gagcgtgagc 1200
 gaacgtattg cgaacacctg caccgatctg ggcttgattt gcggtccgac aggccagagc 1260
 gtggttctgt gcccgcggtt cattctgacc gaagcgcaga tggatgaaat gttcgataaa 1320
 ctggaaaaag cgctggataa agtggttgcg gaagtggcg 1359

<210> 18
 <211> 453
 <212> PRT
 <213> Artificial sequence

<220>
 <223> Engineered variant of v. fluvialis transaminase

<400> 18

Met Asn Lys Pro Gln Ser Trp Glu Thr Arg Ala Glu Thr Tyr Ser Leu
 1 5 10 15

Tyr Gly Phe Thr Asp Met Pro Ser Leu His Gln Arg Gly Thr Val Val
 20 25 30

Val Ala His Gly Glu Gly Pro Tyr Ile Val Asp Val His Gly Arg Arg
 35 40 45

Tyr Leu Asp Ala Met Ser Gly Ala Leu Asn Met Val Ala Gly Phe Asp
 50 55 60

His Lys Gly Leu Ile Asp Ala Ala Lys Ala Gln Tyr Glu Arg Phe Pro
 65 70 75 80

Gly Tyr His Ala Phe Cys Gly Tyr Met Ser Asp Gln Thr Val Met Leu
 85 90 95

CX2-126USP1_ST25

Ser Glu Lys Leu Val Glu Val Ser Pro Phe Asp Ser Gly Arg Val Phe
100 105 110

Tyr Thr Asn Ser Gly Ser Glu Ala Asn Asp Thr Met Val Lys Met Leu
115 120 125

Trp Phe Leu His Ala Ala Glu Gly Lys Pro Gln Lys Arg Lys Ile Leu
130 135 140

Thr Leu Trp Asn Ala Tyr His Gly Cys Thr Val Val Ser Ala Ser Met
145 150 155 160

Thr Gly Phe Pro Phe Asn Ser Val Phe Gly Leu Pro Leu Pro Gly Phe
165 170 175

Leu His Leu Thr Cys Pro His Tyr Trp Arg Tyr Gly Glu Glu Gly Glu
180 185 190

Thr Glu Glu Gln Phe Val Ala Arg Leu Ala Arg Glu Leu Glu Glu Thr
195 200 205

Ile Gln Lys Glu Gly Ala Asp Thr Ile Ala Gly Phe Phe Ala Glu Pro
210 215 220

Val Met Gly Ala Gly Gly Val Ile Pro Pro Ala Lys Gly Tyr Phe Gln
225 230 235 240

Ala Ile Leu Pro Ile Leu Arg Lys Tyr Asp Ile Pro Val Ile Ser Asp
245 250 255

Glu Val Val Cys Gly Phe Gly Arg Thr Gly Asn Thr Trp Gly Cys Val
260 265 270

Thr Tyr Asp Phe Thr Pro Asp Ala Ile Ile Ser Ser Lys Asn Leu Thr
275 280 285

Ala Gly Phe Phe Pro Val Gly Ala Val Ile Leu Gly Pro Glu Leu Ser
290 295 300

Lys Arg Leu Glu Thr Ala Ile Glu Ala Ile Gly Glu Phe Pro His Gly
305 310 315 320

Phe Thr Ala Gly Gly His Pro Val Gly Cys Ala Ile Ala Leu Lys Ala
325 330 335

Ile Asp Val Val Met Asn Glu Gly Leu Ala Glu Asn Val Arg Arg Leu
340 345 350

Ala Pro Arg Phe Glu Glu Arg Leu Lys His Ile Ala Glu His Pro Asn
355 360 365

CX2-126USP1_ST25

Ile Gly Glu Tyr Arg Gly Ile Gly Phe Met Trp Ala Leu Glu Val Val
 370 375 380

Lys Asp Lys Ala Ser Lys Ala Pro Phe Asp Gly Asn Leu Ser Val Ser
 385 390 395 400

Glu Arg Ile Ala Asn Thr Cys Thr Asp Leu Gly Leu Ile Cys Gly Pro
 405 410 415

Thr Gly Gln Ser Val Val Leu Cys Pro Pro Phe Ile Leu Thr Glu Ala
 420 425 430

Gln Met Asp Glu Met Phe Asp Lys Leu Glu Lys Ala Leu Asp Lys Val
 435 440 445

Phe Ala Glu Val Ala
 450

<210> 19
 <211> 1359
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Engineered variant of V. fluvialis transaminase

<400> 19
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 gatatgccga gcctgcatca gcgtggcacc gtggtggtgg cccatggcga aggcccgat 120
 atcgtggatg tgcattggcg tcgttatctg gatgcgatga gcggcgcttt gaacatggtg 180
 gcgggctttg atcataaagg cctgattgat gcggcgaaag cgcagtatga acgttttccg 240
 ggctatcatg cgttttgcgg ctatatgagc gatcagaccg tgatgctgtc tgaaaaactg 300
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 aacgatacca tgggtgaaaat gctgtggttt ctgcatgcgg cggaaggcaa accgcagaaa 420
 cgtaaaattc tgacctgtg gaacgcgtat catggctgca ccgtagtgag cgcgagcatg 480
 accggctttc cgttcaacag cgtgtttggc ctgccgctgc cgggctttct gcatctgacc 540
 tgccgcatt attggcgta tggcgaagaa ggcgaaaccg aagaacagtt tgtcgcgcgt 600
 ctggcccgtg aactggaaga aaccattcag aagggaaggcg cggataccat tgcgggcttt 660
 tttgcggaac cggatgatggg tggcggcggg gttattccgc cggcgaaagg ctattttcag 720
 gcgattctgc cgatcctgcg caaatatgat attccggtga tcagcgatga agtgatttgc 780
 ggctttggcc gtaccggtaa cacctggggc tgcgtgacct atgattttac cccggatgcg 840
 attattagca gtaaaaacct aaccgcgggt ttttttccgg taggcgcggg gattctgggt 900
 ccggaactga gcaaacgtct ggaaaccgcg attgaagcga tcggcgaatt tccgcatggt 960
 tttaccgcgg gcggccatcc ggtgggttgt gcgattgcgc tgaaagcgat tgatgtggtg 1020
 atgaacgaag gcctggccga aaacgtgcgt cgtctggccc cgcgttttga agaacgtctg 1080

CX2-126USP1_ST25

aaacatatg cggaacatcc gaacattggc gaatatcgtg gcattggctt tatgtgggcg 1140
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 gaacgtattg cgaacacctg caccgatctg ggcctgattt gccgtccgac aggccagagc 1260
 gtggttctgt gcccgccgtt cattctgacc gaagcgcaga tggatgaaat gttcgataaa 1320
 ctggaaaaag cgctggataa agtgtttgcg gaagtggcg 1359

<210> 20
 <211> 453
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> Engineered variant of V. fluvialis transaminase
 <400> 20

Met Asn Lys Pro Gln Ser Trp Glu Thr Arg Ala Glu Thr Tyr Ser Leu
 1 5 10 15

Tyr Gly Phe Thr Asp Met Pro Ser Leu His Gln Arg Gly Thr Val Val
 20 25 30

Val Ala His Gly Glu Gly Pro Tyr Ile Val Asp Val His Gly Arg Arg
 35 40 45

Tyr Leu Asp Ala Met Ser Gly Ala Leu Asn Met Val Ala Gly Phe Asp
 50 55 60

His Lys Gly Leu Ile Asp Ala Ala Lys Ala Gln Tyr Glu Arg Phe Pro
 65 70 75 80

Gly Tyr His Ala Phe Cys Gly Tyr Met Ser Asp Gln Thr Val Met Leu
 85 90 95

Ser Glu Lys Leu Val Glu Val Ser Pro Phe Asp Ser Gly Arg Val Phe
 100 105 110

Tyr Thr Asn Ser Gly Ser Glu Ala Asn Asp Thr Met Val Lys Met Leu
 115 120 125

Trp Phe Leu His Ala Ala Glu Gly Lys Pro Gln Lys Arg Lys Ile Leu
 130 135 140

Thr Leu Trp Asn Ala Tyr His Gly Cys Thr Val Val Ser Ala Ser Met
 145 150 155 160

Thr Gly Phe Pro Phe Asn Ser Val Phe Gly Leu Pro Leu Pro Gly Phe
 165 170 175

Leu His Leu Thr Cys Pro His Tyr Trp Arg Tyr Gly Glu Glu Gly Glu
 180 185 190

CX2-126USP1_ST25

Thr Glu Glu Gln Phe Val Ala Arg Leu Ala Arg Glu Leu Glu Glu Thr
195 200 205

Ile Gln Lys Glu Gly Ala Asp Thr Ile Ala Gly Phe Phe Ala Glu Pro
210 215 220

Val Met Gly Gly Gly Gly Val Ile Pro Pro Ala Lys Gly Tyr Phe Gln
225 230 235 240

Ala Ile Leu Pro Ile Leu Arg Lys Tyr Asp Ile Pro Val Ile Ser Asp
245 250 255

Glu Val Ile Cys Gly Phe Gly Arg Thr Gly Asn Thr Trp Gly Cys Val
260 265 270

Thr Tyr Asp Phe Thr Pro Asp Ala Ile Ile Ser Ser Lys Asn Leu Thr
275 280 285

Ala Gly Phe Phe Pro Val Gly Ala Val Ile Leu Gly Pro Glu Leu Ser
290 295 300

Lys Arg Leu Glu Thr Ala Ile Glu Ala Ile Gly Glu Phe Pro His Gly
305 310 315 320

Phe Thr Ala Gly Gly His Pro Val Gly Cys Ala Ile Ala Leu Lys Ala
325 330 335

Ile Asp Val Val Met Asn Glu Gly Leu Ala Glu Asn Val Arg Arg Leu
340 345 350

Ala Pro Arg Phe Glu Glu Arg Leu Lys His Ile Ala Glu His Pro Asn
355 360 365

Ile Gly Glu Tyr Arg Gly Ile Gly Phe Met Trp Ala Leu Glu Val Val
370 375 380

Lys Asp Lys Ala Ser Lys Ala Pro Phe Asp Gly Asn Leu Ser Val Ser
385 390 395 400

Glu Arg Ile Ala Asn Thr Cys Thr Asp Leu Gly Leu Ile Cys Arg Pro
405 410 415

Thr Gly Gln Ser Val Val Leu Cys Pro Pro Phe Ile Leu Thr Glu Ala
420 425 430

Gln Met Asp Glu Met Phe Asp Lys Leu Glu Lys Ala Leu Asp Lys Val
435 440 445

Phe Ala Glu Val Ala
450

CX2-126USP1_ST25

<210> 21
 <211> 1359
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Engineered variant of *V. fluvialis* transaminase

<400> 21
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 atcgtggatg tgcattggcg tcgttatctg gatgcgatga gcggcgcttt gaacatgggtg 180
 gcgggctttg atcataaagg cctgattgat gcggcgaaag cgcagtatga acgttttccg 240
 ggctatcatg cgttttgctg ctatatgagc gatcagaccg tgatgctgtc tgaaaaactg 300
 gtggaagtga gcccgtttga tagcggccgt gtgttttaca ccaacagcgg cagcgaagcg 360
 aacgatacca tgggtgaaaat gctgtggttt ctgcatgcgg cggaaggcaa accgcagaag 420
 cgtaaaattc tgaccctgtg gaacgcgtat catggctgca ccgtagtgag cgcgagcatg 480
 accggctttc cgttcaacag cgtgtttggc ctgccgctgc cgggctttct gcatctgacc 540
 tgcccgcatt attggcggtt tggcgaagaa ggcgaaaccg aagaacagtt tgtcgcgcgt 600
 ctggcccgtg aactggaaga aaccattcag aagggaaggcg cggataccat tgcgggcttt 660
 tttgcggaac cgggtgatgg tgcgtggcgt gttattccgc cggcgaaagg ctattttcag 720
 gcgattctgc cgatcctgcg caaatatgat attccggtga tcagcgatga agtggtgtgc 780
 ggctttggcc gtaccggtaa cacctggggc tgcgtgacct atgattttac cccggatgcg 840
 attattagca gtaaaaacct aaccgcgggt ttttttccgg taggcgcggt gattctgggt 900
 ccggaactga gcaaactctt ggaaaccgcg attgaagcga tcggcgaatt tccgcattgt 960
 tttaccgcgg gcggccatcc ggtgggttgt gcgattgcgc tgaaagcgat tgatgtggtg 1020
 atgaacgaag gcctggccga aaacgtgcgt cgtctggccc cgcgttttga agaactctg 1080
 aaacatattg cggaacatcc gaacattggc gaatatcgtg gcattggctt tatgtgggcg 1140
 ctggaagttg tgaaagataa agcgagcaaa gccccgtttg atggcaacct gagcgtgagc 1200
 gaacgtattg cgaacacctg caccgatctg ggcctgattt gcgttccgac aggccagagc 1260
 gtggtactgt gcccgcggtt cattctgacc gaagcgcaga tggatgaaat gttcgataaa 1320
 ctggaaaaag cgctggataa agtggttgcg gaagtggcg 1359

<210> 22
 <211> 453
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> Engineered variant of *V. fluvialis* transaminase

<400> 22

CX2-126USP1_ST25

Met Asn Lys Pro Gln Ser Trp Glu Thr Arg Ala Glu Thr Tyr Ser Leu
1 5 10 15

Tyr Gly Phe Thr Asp Met Pro Ser Leu His Gln Arg Gly Thr Val Val
20 25 30

Val Ala His Gly Glu Gly Pro Tyr Ile Val Asp Val His Gly Arg Arg
35 40 45

Tyr Leu Asp Ala Met Ser Gly Ala Leu Asn Met Val Ala Gly Phe Asp
50 55 60

His Lys Gly Leu Ile Asp Ala Ala Lys Ala Gln Tyr Glu Arg Phe Pro
65 70 75 80

Gly Tyr His Ala Phe Cys Gly Tyr Met Ser Asp Gln Thr Val Met Leu
85 90 95

Ser Glu Lys Leu Val Glu Val Ser Pro Phe Asp Ser Gly Arg Val Phe
100 105 110

Tyr Thr Asn Ser Gly Ser Glu Ala Asn Asp Thr Met Val Lys Met Leu
115 120 125

Trp Phe Leu His Ala Ala Glu Gly Lys Pro Gln Lys Arg Lys Ile Leu
130 135 140

Thr Leu Trp Asn Ala Tyr His Gly Cys Thr Val Val Ser Ala Ser Met
145 150 155 160

Thr Gly Phe Pro Phe Asn Ser Val Phe Gly Leu Pro Leu Pro Gly Phe
165 170 175

Leu His Leu Thr Cys Pro His Tyr Trp Arg Tyr Gly Glu Glu Gly Glu
180 185 190

Thr Glu Glu Gln Phe Val Ala Arg Leu Ala Arg Glu Leu Glu Glu Thr
195 200 205

Ile Gln Lys Glu Gly Ala Asp Thr Ile Ala Gly Phe Phe Ala Glu Pro
210 215 220

Val Met Gly Ala Gly Gly Val Ile Pro Pro Ala Lys Gly Tyr Phe Gln
225 230 235 240

Ala Ile Leu Pro Ile Leu Arg Lys Tyr Asp Ile Pro Val Ile Ser Asp
245 250 255

Glu Val Val Cys Gly Phe Gly Arg Thr Gly Asn Thr Trp Gly Cys Val
260 265 270

CX2-126USP1_ST25

Thr Tyr Asp Phe Thr Pro Asp Ala Ile Ile Ser Ser Lys Asn Leu Thr
275 280 285

Ala Gly Phe Phe Pro Val Gly Ala Val Ile Leu Gly Pro Glu Leu Ser
290 295 300

Lys Arg Leu Glu Thr Ala Ile Glu Ala Ile Gly Glu Phe Pro His Gly
305 310 315 320

Phe Thr Ala Gly Gly His Pro Val Gly Cys Ala Ile Ala Leu Lys Ala
325 330 335

Ile Asp Val Val Met Asn Glu Gly Leu Ala Glu Asn Val Arg Arg Leu
340 345 350

Ala Pro Arg Phe Glu Glu Arg Leu Lys His Ile Ala Glu His Pro Asn
355 360 365

Ile Gly Glu Tyr Arg Gly Ile Gly Phe Met Trp Ala Leu Glu Val Val
370 375 380

Lys Asp Lys Ala Ser Lys Ala Pro Phe Asp Gly Asn Leu Ser Val Ser
385 390 395 400

Glu Arg Ile Ala Asn Thr Cys Thr Asp Leu Gly Leu Ile Cys Val Pro
405 410 415

Thr Gly Gln Ser Val Val Leu Cys Pro Pro Phe Ile Leu Thr Glu Ala
420 425 430

Gln Met Asp Glu Met Phe Asp Lys Leu Glu Lys Ala Leu Asp Lys Val
435 440 445

Phe Ala Glu Val Ala
450

<210> 23
<211> 1359
<212> DNA
<213> Artificial Sequence

<220>
<223> Engineered variant of V. fluvialis transaminase

<400> 23
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atcgtggatg tgcattggccg tcgttatctg gatgcgatga gcggcgcttt gaacatggtg 180
gcgggctttg atcataaagg cctgattgat gcggcgaaag cgagtatga acgttttccg 240
ggctatcatg cgttttgccg ctatatgagc gatcagaccg tgatgctgtc tgaaaaactg 300
gtggaagtga gcccgtttga tagcggccgt gtgttttata ccaacagcgg cagcgaagcg 360

CX2-126USP1_ST25

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aacgatacca tgggtgaaaat gctgtggttt ctgcatgcgg cggaaggcaa accgcagaaa      420
cgtaaaattc tgaccctgtg gaacgcgtat catggctgca ccgtagtgag cgcgagcatg      480
accggctttc cgttcaacag cgtgtttggc ctgccgctgc cgggctttct gcacttgacc      540
tgcccgcatc attggcggtt tggcgaagaa ggcgaaaccg aagaacagtt tgtcgcgcgt      600
ctggcccgtg aactggaaga aaccattcag aaggaaggcg cgataccat tgcgggcttt      660
tttgcggaac cggatgatggg tggcggcggg gttattccgc cggcgaaagg ctattttcag      720
gcgattctgc cgatcctgcg caaatatgat attccggtga tcagcgatga agtgggtgtgc      780
ggctttggcc gtaccggtaa cacctggggc tgcgtgacct atgattttgc cccggatgcg      840
attattagca gtaaaaacct aaccgcgggt ttttttccgg taggcgcggg gattctgggt      900
ccggaactga gcaaactgtc ggaaaccgcg attgaagcga tcggcgaatt tccgcatggt      960
tttaccgcgg gcggccatcc ggtgggttgt gcgattgcgc tgaaagcgat tgatgtggtg     1020
atgaacgaag gcctggccga aaacgtgcgt cgtctggccc cgcgttttga agaactctg     1080
aaacatattg cggaacatcc gaacattggc gaatatcgtg gcattggctt tatgtgggcg     1140
ctggaagtgt tgaaagataa agcgagcaaa gccccgtttg atggcaacct gagcgtgagc     1200
gaacgtattg cgaacacctg caccgatctg ggcctgattt gcggtccgac aggccagagc     1260
gtggtttctgt gcccgcggtt cattctgacc gaagcgcaga tggatgaaat gttcgataaa     1320
ctggaaaaag cgctggataa agtgtttgcg gaagtggcg                                1359

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<210> 24
 <211> 453
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> Engineered variant of V. fluvialis transaminase

<400> 24

Met Asn Lys Pro Gln Ser Trp Glu Thr Arg Ala Glu Thr Tyr Ser Leu
 1 5 10 15

Tyr Gly Phe Thr Asp Met Pro Ser Leu His Gln Arg Gly Thr Val Val
 20 25 30

Val Ala His Gly Glu Gly Pro Tyr Ile Val Asp Val His Gly Arg Arg
 35 40 45

Tyr Leu Asp Ala Met Ser Gly Ala Leu Asn Met Val Ala Gly Phe Asp
 50 55 60

His Lys Gly Leu Ile Asp Ala Ala Lys Ala Gln Tyr Glu Arg Phe Pro
 65 70 75 80

Gly Tyr His Ala Phe Cys Gly Tyr Met Ser Asp Gln Thr Val Met Leu
 85 90 95

CX2-126USP1_ST25

Ser Glu Lys Leu Val Glu Val Ser Pro Phe Asp Ser Gly Arg Val Phe
100 105 110

Tyr Thr Asn Ser Gly Ser Glu Ala Asn Asp Thr Met Val Lys Met Leu
115 120 125

Trp Phe Leu His Ala Ala Glu Gly Lys Pro Gln Lys Arg Lys Ile Leu
130 135 140

Thr Leu Trp Asn Ala Tyr His Gly Cys Thr Val Val Ser Ala Ser Met
145 150 155 160

Thr Gly Phe Pro Phe Asn Ser Val Phe Gly Leu Pro Leu Pro Gly Phe
165 170 175

Leu His Leu Thr Cys Pro His Tyr Trp Arg Tyr Gly Glu Glu Gly Glu
180 185 190

Thr Glu Glu Gln Phe Val Ala Arg Leu Ala Arg Glu Leu Glu Glu Thr
195 200 205

Ile Gln Lys Glu Gly Ala Asp Thr Ile Ala Gly Phe Phe Ala Glu Pro
210 215 220

Val Met Gly Gly Gly Gly Val Ile Pro Pro Ala Lys Gly Tyr Phe Gln
225 230 235 240

Ala Ile Leu Pro Ile Leu Arg Lys Tyr Asp Ile Pro Val Ile Ser Asp
245 250 255

Glu Val Val Cys Gly Phe Gly Arg Thr Gly Asn Thr Trp Gly Cys Val
260 265 270

Thr Tyr Asp Phe Ala Pro Asp Ala Ile Ile Ser Ser Lys Asn Leu Thr
275 280 285

Ala Gly Phe Phe Pro Val Gly Ala Val Ile Leu Gly Pro Glu Leu Ser
290 295 300

Lys Arg Leu Glu Thr Ala Ile Glu Ala Ile Gly Glu Phe Pro His Gly
305 310 315 320

Phe Thr Ala Gly Gly His Pro Val Gly Cys Ala Ile Ala Leu Lys Ala
325 330 335

Ile Asp Val Val Met Asn Glu Gly Leu Ala Glu Asn Val Arg Arg Leu
340 345 350

Ala Pro Arg Phe Glu Glu Arg Leu Lys His Ile Ala Glu His Pro Asn
355 360 365

CX2-126USP1_ST25

Ile Gly Glu Tyr Arg Gly Ile Gly Phe Met Trp Ala Leu Glu Val Val
370 375 380

Lys Asp Lys Ala Ser Lys Ala Pro Phe Asp Gly Asn Leu Ser Val Ser
385 390 395 400

Glu Arg Ile Ala Asn Thr Cys Thr Asp Leu Gly Leu Ile Cys Gly Pro
405 410 415

Thr Gly Gln Ser Val Val Leu Cys Pro Pro Phe Ile Leu Thr Glu Ala
420 425 430

Gln Met Asp Glu Met Phe Asp Lys Leu Glu Lys Ala Leu Asp Lys Val
435 440 445

Phe Ala Glu Val Ala
450

<210> 25
<211> 1359
<212> DNA
<213> Artificial Sequence

<220>
<223> Engineered variant of V. fluvialis transaminase

<400> 25	
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atcgtggatg tgcattggcg tcgttatctg gatgcgatga gcggcgcttt gaacatggtg	180
gcgggctttg atcataaagg cctgattgat gcggcgaaaag cgcagtatga acgttttccg	240
ggctatcatg cgttttgcgg ctatatgagc gatcagaccg tgatgctgtc tgaaaaactg	300
gtggaagtga gcccgtttga tagcggccgt gtgttttata ccaacagcgg cagcgaagcg	360
aacgatacca tgggtgaaaat gctgtggttt ctgcatgcgg cggaaggcaa accgcagaaa	420
cgtaaaattc tgaccctgtg gaacgcgtat catggctgca ccgtagtgag cgcgagcatg	480
accggctttc cgttcaacag cgtgtttggc ctgccgctgc cgggctttct gcatctgacc	540
tgcccgcatt attggcggtta tggcgaagaa ggcgaaaccg aagaacagtt tgtcgcgcgt	600
ctggcccgtg aactggaaga aaccattcag aaggaaaggcg cggataccat tgcgggcttt	660
tttgcggaac cggatgatggg tgctggcggg gttattccgc cggcgaaagg ctattttcag	720
gcgattctgc cgatcctgcg caaatatgat attccgggtga tcagcgatga agtgggtgtgc	780
ggctttggcc gtaccggtaa cacctggggc tgcgtgacct atgattttac cccggatgcg	840
attattagca gtaaaaacct aaccgcgggt ttttttccgg taggcgcggg gattctgggt	900
ccggaactga gcaaactgtt ggaaaccgcg attgaagcga tcggcgaatt tccgcatggt	960
tttaccgcgg gcggccatcc ggtgggttgt gcgattgcgc tgaaagcgat tgatgtggtg	1020

CX2-126USP1_ST25

atgaacgaag gcctggccga aaacgtgctg cgtctggccc cgcgttttga agaacgtctg 1080
aaacatatattg cggaacatcc gaacattggc gaatatcgtg gcattggcctt tatgtgggcg 1140
ctggaagttg tgaaagataa agcgagcaaa gccccgtttg atggcaacct gagcgtgagc 1200
gaacgtattg cgaacacctg caccgatctg ggcctgattt gccgtccgac aggccagagc 1260
gtggttctgt gccccgccgtt cattctgacc gaagcgcaga tggatgaaat gttcgataaa 1320
ctggaaaaag cgctggataa agtgtttgcg gaagtggcg 1359

<210> 26
<211> 453
<212> PRT
<213> Artificial sequence

<220>
<223> Engineered variant of v. fluvialis transaminase

<400> 26

Met Asn Lys Pro Gln Ser Trp Glu Thr Arg Ala Glu Thr Tyr Ser Leu
1 5 10 15

Tyr Gly Phe Thr Asp Met Pro Ser Leu His Gln Arg Gly Thr Val Val
20 25 30

Val Ala His Gly Glu Gly Pro Tyr Ile Val Asp Val His Gly Arg Arg
35 40 45

Tyr Leu Asp Ala Met Ser Gly Ala Leu Asn Met Val Ala Gly Phe Asp
50 55 60

His Lys Gly Leu Ile Asp Ala Ala Lys Ala Gln Tyr Glu Arg Phe Pro
65 70 75 80

Gly Tyr His Ala Phe Cys Gly Tyr Met Ser Asp Gln Thr Val Met Leu
85 90 95

Ser Glu Lys Leu Val Glu Val Ser Pro Phe Asp Ser Gly Arg Val Phe
100 105 110

Tyr Thr Asn Ser Gly Ser Glu Ala Asn Asp Thr Met Val Lys Met Leu
115 120 125

Trp Phe Leu His Ala Ala Glu Gly Lys Pro Gln Lys Arg Lys Ile Leu
130 135 140

Thr Leu Trp Asn Ala Tyr His Gly Cys Thr Val Val Ser Ala Ser Met
145 150 155 160

Thr Gly Phe Pro Phe Asn Ser Val Phe Gly Leu Pro Leu Pro Gly Phe
165 170 175

Leu His Leu Thr Cys Pro His Tyr Trp Arg Tyr Gly Glu Glu Gly Glu
 180 185 190
 Thr Glu Glu Gln Phe Val Ala Arg Leu Ala Arg Glu Leu Glu Glu Thr
 195 200 205
 Ile Gln Lys Glu Gly Ala Asp Thr Ile Ala Gly Phe Phe Ala Glu Pro
 210 215 220
 Val Met Gly Ala Gly Gly Val Ile Pro Pro Ala Lys Gly Tyr Phe Gln
 225 230 235 240
 Ala Ile Leu Pro Ile Leu Arg Lys Tyr Asp Ile Pro Val Ile Ser Asp
 245 250 255
 Glu Val Val Cys Gly Phe Gly Arg Thr Gly Asn Thr Trp Gly Cys Val
 260 265 270
 Thr Tyr Asp Phe Thr Pro Asp Ala Ile Ile Ser Ser Lys Asn Leu Thr
 275 280 285
 Ala Gly Phe Phe Pro Val Gly Ala Val Ile Leu Gly Pro Glu Leu Ser
 290 295 300
 Lys Arg Leu Glu Thr Ala Ile Glu Ala Ile Gly Glu Phe Pro His Gly
 305 310 315 320
 Phe Thr Ala Gly Gly His Pro Val Gly Cys Ala Ile Ala Leu Lys Ala
 325 330 335
 Ile Asp Val Val Met Asn Glu Gly Leu Ala Glu Asn Val Arg Arg Leu
 340 345 350
 Ala Pro Arg Phe Glu Glu Arg Leu Lys His Ile Ala Glu His Pro Asn
 355 360 365
 Ile Gly Glu Tyr Arg Gly Ile Gly Phe Met Trp Ala Leu Glu Val Val
 370 375 380
 Lys Asp Lys Ala Ser Lys Ala Pro Phe Asp Gly Asn Leu Ser Val Ser
 385 390 395 400
 Glu Arg Ile Ala Asn Thr Cys Thr Asp Leu Gly Leu Ile Cys Arg Pro
 405 410 415
 Thr Gly Gln Ser Val Val Leu Cys Pro Pro Phe Ile Leu Thr Glu Ala
 420 425 430
 Gln Met Asp Glu Met Phe Asp Lys Leu Glu Lys Ala Leu Asp Lys Val
 435 440 445

Phe Ala Glu Val Ala
450

<210> 27
<211> 1359
<212> DNA
<213> Artificial Sequence

<220>
<223> Engineered variant of *V. fluvialis* transaminase

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<400> 27
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atcgtggatg tgcattggccg tcgttatctg gatgcgatga gcggcgcttt gaacatggtg      180
gcgggctttg atcataaagg cctgattgat gcggcgaaaag cgcagtatga acgttttccg      240
ggctatcatg cgttttgcgg ctatatgagc gatcagaccg tgatgctgtc tgaaaaactg      300
gtggaagtga gcccgtttga tagcggccgt gtgttttata ccaacagcgg cagcgaagcg      360
aacgatacca tgggtgaaaat gctgtggttt ctgcatgcgg cggaaggcaa accgcagaaa      420
cgtaaaattc tgaccctgtg gaacgcgtat catggctgca ccgtagtgag cgcgagcatg      480
accggctttc cgttcaacag cgtgtttggc ctgccgctgc cgggctttct gcattctgacc      540
tgcccgcatt attggcggtt tggcgaagaa ggcgaaaccg aagaacagtt tgcgcgcgt      600
ctggcccgtg aactggaaga aaccattcag aagggaaggcg cggataccat tgcgggcttt      660
tttgcggaac cgggtgatggg tggcggcggg gttattccgc cggcgaaaagg ctattttcag      720
gcgattctgc cgatcctgcg caaatatgat gttccgggtg tcagcgatga agtggtgtgc      780
ggctttggcc gtaccggtta cacctggggc tgcgtgacct atgattttac cccggatgcg      840
attattagca gtaaaaacct aaccgcgggt ttttttccgg taggcgcggg gattctgggt      900
ccggaactga gcaaacgtct ggaaaccgcg attgaagcga tcggcgaatt tccgcatggt      960
tttaccgcgg gcggccatcc ggtgggttgt gcgattgcgc tgaaagcgat tgatgtggtg     1020
atgaacgaag gcctggccga aaacgtgcgt cgtctggccc cgcgttttga agaacgtctg     1080
aaacatattg cggaacatcc gaacattggc gaatatcgtg gcattggctt tatgtgggcg     1140
ctggaagtgt tgaaagataa agcgagcaaa gccccgtttg atggcaacct gagcgcgagc     1200
gaacgtattg cgaacacctg caccgatctg ggcctgattt gccgtccgac aggccagagc     1260
gtggttctgt gcccgcggtt cattctgacc gaagcgcaga tggatgaaat gttcgataaa     1320
ctggaaaaag cgctggataa agtgtttgcg gaagtggcg      1359

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<210> 28
<211> 453
<212> PRT
<213> Artificial Sequence

<220>
<223> Engineered variant of *V. fluvialis* transaminase

<400> 28

Met Asn Lys Pro Gln Ser Trp Glu Thr Arg Ala Glu Thr Tyr Ser Leu
 1 5 10 15

Tyr Gly Phe Thr Asp Met Pro Ser Leu His Gln Arg Gly Thr Val Val
 20 25 30

Val Ala His Gly Glu Gly Pro Tyr Ile Val Asp Val His Gly Arg Arg
 35 40 45

Tyr Leu Asp Ala Met Ser Gly Ala Leu Asn Met Val Ala Gly Phe Asp
 50 55 60

His Lys Gly Leu Ile Asp Ala Ala Lys Ala Gln Tyr Glu Arg Phe Pro
 65 70 75 80

Gly Tyr His Ala Phe Cys Gly Tyr Met Ser Asp Gln Thr Val Met Leu
 85 90 95

Ser Glu Lys Leu Val Glu Val Ser Pro Phe Asp Ser Gly Arg Val Phe
 100 105 110

Tyr Thr Asn Ser Gly Ser Glu Ala Asn Asp Thr Met Val Lys Met Leu
 115 120 125

Trp Phe Leu His Ala Ala Glu Gly Lys Pro Gln Lys Arg Lys Ile Leu
 130 135 140

Thr Leu Trp Asn Ala Tyr His Gly Cys Thr Val Val Ser Ala Ser Met
 145 150 155 160

Thr Gly Phe Pro Phe Asn Ser Val Phe Gly Leu Pro Leu Pro Gly Phe
 165 170 175

Leu His Leu Thr Cys Pro His Tyr Trp Arg Tyr Gly Glu Glu Gly Glu
 180 185 190

Thr Glu Glu Gln Phe Val Ala Arg Leu Ala Arg Glu Leu Glu Glu Thr
 195 200 205

Ile Gln Lys Glu Gly Ala Asp Thr Ile Ala Gly Phe Phe Ala Glu Pro
 210 215 220

Val Met Gly Gly Gly Gly Val Ile Pro Pro Ala Lys Gly Tyr Phe Gln
 225 230 235 240

Ala Ile Leu Pro Ile Leu Arg Lys Tyr Asp Val Pro Val Ile Ser Asp
 245 250 255

Glu Val Val Cys Gly Phe Gly Arg Thr Gly Asn Thr Trp Gly Cys Val
 260 265 270

CX2-126USP1_ST25

Thr Tyr Asp Phe Thr Pro Asp Ala Ile Ile Ser Ser Lys Asn Leu Thr
275 280 285

Ala Gly Phe Phe Pro Val Gly Ala Val Ile Leu Gly Pro Glu Leu Ser
290 295 300

Lys Arg Leu Glu Thr Ala Ile Glu Ala Ile Gly Glu Phe Pro His Gly
305 310 315 320

Phe Thr Ala Gly Gly His Pro Val Gly Cys Ala Ile Ala Leu Lys Ala
325 330 335

Ile Asp Val Val Met Asn Glu Gly Leu Ala Glu Asn Val Arg Arg Leu
340 345 350

Ala Pro Arg Phe Glu Glu Arg Leu Lys His Ile Ala Glu His Pro Asn
355 360 365

Ile Gly Glu Tyr Arg Gly Ile Gly Phe Met Trp Ala Leu Glu Val Val
370 375 380

Lys Asp Lys Ala Ser Lys Ala Pro Phe Asp Gly Asn Leu Ser Ala Ser
385 390 395 400

Glu Arg Ile Ala Asn Thr Cys Thr Asp Leu Gly Leu Ile Cys Arg Pro
405 410 415

Thr Gly Gln Ser Val Val Leu Cys Pro Pro Phe Ile Leu Thr Glu Ala
420 425 430

Gln Met Asp Glu Met Phe Asp Lys Leu Glu Lys Ala Leu Asp Lys Val
435 440 445

Phe Ala Glu Val Ala
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<210> 29
<211> 1359
<212> DNA
<213> Artificial Sequence

<220>
<223> Engineered variant of V. fluvialis transaminase

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	atcgtggatg tgcattggccg tcgttatctg gatgcgaaca gcggcgcttt gaacatggtg	180
	gcgggctttg atcataaagg cctgattgat gcggcgaaaag cgcagtatga acgttttccg	240
	ggctatcatg cgttttcagg ccatatgagc gatcagaccg tgatgctgtc tgaaaaactg	300

CX2-126USP1_ST25

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cgtaaaattc tgacccgctg gaacgcgtat catggctgta ccgtagtgag cgcgagcatg 480
accggctttc cgtataacag cgtgtttggc ctgccgctgc cgggctttct gcatctgacc 540
tgcccgcatt attggcggtta tggcgaagaa ggcgaaaccg aagaacagtt tgtcgcgcgt 600
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tttgcggaac cgggtgatggg tgctggcggg gttattacac cggcgaaagg ctattttcag 720
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gaacgtattg cgaacacctg caccgatctg ggcctgattt gccgtccgac aggccagagc 1260
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<210> 30

<211> 453

<212> PRT

<213> Artificial Sequence

<220>

<223> Engineered variant of V. fluvialis transaminase

<400> 30

Met Asn Lys Pro Gln Ser Trp Glu Thr Arg Ala Glu Thr Tyr Ser Leu
1 5 10 15

Tyr Ala Phe Thr Asp Met Pro Ser Leu His Gln Arg Gly Thr Val Val
20 25 30

Val Ala His Gly Glu Gly Pro Tyr Ile Val Asp Val His Gly Arg Arg
35 40 45

Tyr Leu Asp Ala Asn Ser Gly Ala Leu Asn Met Val Ala Gly Phe Asp
50 55 60

His Lys Gly Leu Ile Asp Ala Ala Lys Ala Gln Tyr Glu Arg Phe Pro
65 70 75 80

CX2-126USP1_ST25

Gly Tyr His Ala Phe Ser Gly His Met Ser Asp Gln Thr Val Met Leu
85 90 95

Ser Glu Lys Leu Val Glu Val Ser Pro Phe Asp Ser Gly Arg Val Phe
100 105 110

Tyr Thr Asn Ser Gly Ser Glu Ala Asn Asp Thr Met Val Lys Met Leu
115 120 125

Trp Phe Leu His Ala Ala Glu Gly Lys Pro Gln Lys Arg Lys Ile Leu
130 135 140

Thr Arg Trp Asn Ala Tyr His Gly Cys Thr Val Val Ser Ala Ser Met
145 150 155 160

Thr Gly Phe Pro Tyr Asn Ser Val Phe Gly Leu Pro Leu Pro Gly Phe
165 170 175

Leu His Leu Thr Cys Pro His Tyr Trp Arg Tyr Gly Glu Glu Gly Glu
180 185 190

Thr Glu Glu Gln Phe Val Ala Arg Leu Ala Arg Glu Leu Glu Glu Thr
195 200 205

Ile Gln Lys Glu Gly Ala Asp Thr Ile Ala Gly Phe Phe Ala Glu Pro
210 215 220

Val Met Gly Ala Gly Gly Val Ile Thr Pro Ala Lys Gly Tyr Phe Gln
225 230 235 240

Ala Ile Leu Pro Ile Leu Arg Lys Tyr Asp Ile Pro Val Ile Ser Asp
245 250 255

Glu Val Ile Cys Gly Phe Gly Arg Thr Gly Asn Thr Trp Gly Cys Val
260 265 270

Thr Tyr Asp Phe Thr Pro Asp Ala Ile Ile Ser Ser Lys Asn Leu Thr
275 280 285

Ala Gly Phe Phe Pro Val Gly Ala Val Ile Leu Gly Pro Glu Leu Ser
290 295 300

Lys Arg Leu Glu Thr Ala Ile Glu Ala Ile Gly Glu Phe Pro His Gly
305 310 315 320

Phe Thr Ala Gly Gly His Pro Val Gly Cys Ala Ile Ala Leu Lys Ala
325 330 335

Ile Asp Val Val Met Asn Glu Gly Leu Ala Glu Asn Val Arg Arg Leu
340 345 350

CX2-126USP1_ST25

Ala Pro Arg Phe Glu Glu Arg Leu Lys His Ile Ala Glu Arg Pro Asn
355 360 365

Ile Gly Glu Tyr Arg Gly Ile Gly Phe Met Trp Ala Leu Glu Val Val
370 375 380

Lys Asp Lys Ala Ser Lys Ala Pro Phe Asp Gly Asn Leu Ser Val Ser
385 390 395 400

Glu Arg Ile Ala Asn Thr Cys Thr Asp Leu Gly Leu Ile Cys Arg Pro
405 410 415

Thr Gly Gln Ser Val Val Leu Cys Pro Pro Phe Ile Leu Thr Glu Ala
420 425 430

Gln Met Asp Glu Met Phe Asp Lys Leu Glu Lys Ala Leu Asp Lys Val
435 440 445

Phe Ala Glu Val Ala
450

<210> 31
<211> 1359
<212> DNA
<213> Artificial Sequence

<220>
<223> Engineered variant of V. fluvialis transaminase

<400> 31
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atcgtggatg tgcattggccg tcgttatctg gatgcgaaca gcggcgcttt gaacatggtg 180
gcgggctttg atcataaagg cctgattgat gcggcgaaag cgcagtatga acgttttccg 240
ggctatcatg cgttttcagg ccatatgagc gatcagaccg tgatgctgtc tgaaaaactg 300
gtggaagtga gcccgtttga tagcggccgt gtgttttata ccaacagcgg cagcgaagcg 360
aacgatacca tgggtgaaaat gctgtggttt ctgcatgcgg cggaaggcaa accgcagaaa 420
cgtaaaattc tgacccgctg gaacgcgtat catggctgta ccgtagtgag cgcgagcatg 480
accggctttc cgtataacag cgtgtttggc ctgccgctgc cgggctttct gcatctgacc 540
tgcccgcatc attggcggtt tggcgaagaa ggcgaaaccg aagaacagtt tgtcgcgcgt 600
ctggcccgtg aactggaaga aaccattcag aagggaaggcg cggataccat tgcgggcttt 660
tttgcggaac cgggtgatggg tgctggcggg gttattacac cggcgaaagg ctattttcag 720
gcgattctga ctatcctgcg caaatatgat attccgggtga tcagcgatga agtgatttgc 780
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CX2-126USP1_ST25

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atgaacgaag gcctggccga aaacgtgcgt cgtctggccc cgcgttttga agaacgtctg 1080
aaacatattg cggaacgtcc gaacattggc gaatatcgtg gcattggctt tatgtgggcg 1140
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gaacgtattg cgaacacctg caccgatctg ggcctgattt gccgtccgac aggccagagc 1260
gtggttctgt gcccgccgtt tattctgacc gaagcgcaga tggatgaaat gttcgataaa 1320
ctggaaaaag cgctggataa agtgtttgcg gaagtggcg 1359

<210> 32
<211> 453
<212> PRT
<213> Artificial Sequence

<220>
<223> Engineered variant of V. fluvialis transaminase

<400> 32

Met Asn Lys Pro Gln Ser Trp Glu Thr Arg Ala Glu Thr Tyr Ser Leu
1 5 10 15

Tyr Gly Phe Thr Asp Met Pro Ser Leu His Gln Arg Gly Thr Met Val
20 25 30

Val Ala His Gly Glu Gly Pro Tyr Ile Val Asp Val His Gly Arg Arg
35 40 45

Tyr Leu Asp Ala Asn Ser Gly Ala Leu Asn Met Val Ala Gly Phe Asp
50 55 60

His Lys Gly Leu Ile Asp Ala Ala Lys Ala Gln Tyr Glu Arg Phe Pro
65 70 75 80

Gly Tyr His Ala Phe Ser Gly His Met Ser Asp Gln Thr Val Met Leu
85 90 95

Ser Glu Lys Leu Val Glu Val Ser Pro Phe Asp Ser Gly Arg Val Phe
100 105 110

Tyr Thr Asn Ser Gly Ser Glu Ala Asn Asp Thr Met Val Lys Met Leu
115 120 125

Trp Phe Leu His Ala Ala Glu Gly Lys Pro Gln Lys Arg Lys Ile Leu
130 135 140

Thr Arg Trp Asn Ala Tyr His Gly Cys Thr Val Val Ser Ala Ser Met
145 150 155 160

Thr Gly Phe Pro Tyr Asn Ser Val Phe Gly Leu Pro Leu Pro Gly Phe
165 170 175

CX2-126USP1_ST25

Leu His Leu Thr Cys Pro His Tyr Trp Arg Tyr Gly Glu Glu Gly Glu
 180 185 190
 Thr Glu Glu Gln Phe Val Ala Arg Leu Ala Arg Glu Leu Glu Glu Thr
 195 200 205
 Ile Gln Lys Glu Gly Ala Asp Thr Ile Ala Gly Phe Phe Ala Glu Pro
 210 215 220
 Val Met Gly Ala Gly Gly Val Ile Thr Pro Ala Lys Gly Tyr Phe Gln
 225 230 235 240
 Ala Ile Leu Thr Ile Leu Arg Lys Tyr Asp Ile Pro Val Ile Ser Asp
 245 250 255
 Glu Val Ile Cys Gly Phe Gly Arg Thr Gly Asn Thr Trp Gly Cys Val
 260 265 270
 Thr Tyr Asp Phe Thr Pro Asp Ala Ile Ile Ser Ser Lys Asn Leu Thr
 275 280 285
 Ala Gly Phe Phe Pro Val Gly Ala Val Ile Leu Gly Pro Glu Leu Ser
 290 295 300
 Lys Arg Leu Glu Thr Ala Ile Glu Ala Ile Gly Glu Phe Pro His Gly
 305 310 315 320
 Phe Thr Ala Gly Gly His Pro Val Gly Cys Ala Ile Ala Leu Lys Ala
 325 330 335
 Ile Asp Val Val Met Asn Glu Gly Leu Ala Glu Asn Val Arg Arg Leu
 340 345 350
 Ala Pro Arg Phe Glu Glu Arg Leu Lys His Ile Ala Glu Arg Pro Asn
 355 360 365
 Ile Gly Glu Tyr Arg Gly Ile Gly Phe Met Trp Ala Leu Glu Val Val
 370 375 380
 Lys Asp Lys Ala Ser Lys Ala Pro Phe Asp Gly Asn Leu Ser Val Ser
 385 390 395 400
 Glu Arg Ile Ala Asn Thr Cys Thr Asp Leu Gly Leu Ile Cys Arg Pro
 405 410 415
 Thr Gly Gln Ser Val Val Leu Cys Pro Pro Phe Ile Leu Thr Glu Ala
 420 425 430
 Gln Met Asp Glu Met Phe Asp Lys Leu Glu Lys Ala Leu Asp Lys Val
 435 440 445

Phe Ala Glu Val Ala
450

<210> 33
<211> 1359
<212> DNA
<213> Artificial Sequence

<220>
<223> Engineered variant of *V. fluvialis* transaminase

<400> 33
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atcgtggatg tgcattggcg tcgttatctg gatgcgaaca gcggcgcttt gaacatggtg 180
gcgggctttg atcataaagg cctgattgat gcggcgaaaag cgagtatga acgttttccg 240
ggctatcatg cgttttcagg ccattatgagc gatcagaccg tgatgctgtc tgaaaaactg 300
gtggaagtga gcccgtttga tagcggccgt gtgttttata ccaacagcgg cagcgaagcg 360
aacgatacca tgggtgaaaat gctgtggttt ctgcatgcgg cggaaggcaa accgcagaaa 420
cgtaaaattc tgaccgcgtg gaacgcgtat catggctgta ccgtagtgag cgcgagcatg 480
accggctttc cgtataacag cgtgtttggc ctgccgctgc cgggctttct gcatctgacc 540
tgccgcatt attggcgta tggcgaagaa ggcgaaaccg aagaacagtt tgcgcgcgt 600
ctggcccgtg aactggaaga aaccattcag aagggaaggcg cggataccat tgcgggcttt 660
tttgcggaac cggatgatgg tgctggcggg gttattccgc cggcgaaagg ctattttcag 720
gcgattctgc cgatcctgcg caaatatgat attccgggta tcagcgatga agtgatttgc 780
ggctttggcc gtaccggtaa cacctggggc tgcgtgacct atgattttac cccgatgacg 840
attattagca gtaaaaacct aaccgcgggt ttttttccgg taggcgcggg gattctgggt 900
ccggaactga gcaaacgtct ggaaaccgcg attgaagcga tcggcgaatt tccgatggg 960
tttaccgcgg gcggccatcc ggtgggttgt gcgattgcgc tgaaagcgat tgatgtggtg 1020
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aaacatattg cggaacgtcc gaacattggc gaatatcgtg gcattggctt tatgtgggcg 1140
ctggaagtcg tgaaagataa agcgagcaaa gccccgtttg atggcaacct gagcgtgagc 1200
gaacgtattg cgaacacctg caccgatctg ggcctgattt gccgtccgac aggccagagc 1260
gtggttctgg caccgccgtt tattctgacc gaagcgcaga tggatgaaat gttcgataaa 1320
ctggaaaaag cgctggataa agtgtttgcg gaagtggcg 1359

<210> 34
<211> 453
<212> PRT
<213> Artificial Sequence

<220>

<223> Engineered variant of *V. fluvialis* transaminase

<400> 34

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Met Asn Lys Pro Gln Ser Trp Glu Thr Arg Ala Glu Thr Tyr Ser Leu
1      5      10      15

Tyr Gly Phe Thr Asp Met Pro Ser Leu His Gln Arg Gly Thr Met Val
      20      25      30

Val Ala His Gly Glu Gly Pro Tyr Ile Val Asp Val His Gly Arg Arg
      35      40      45

Tyr Leu Asp Ala Asn Ser Gly Ala Leu Asn Met Val Ala Gly Phe Asp
      50      55      60

His Lys Gly Leu Ile Asp Ala Ala Lys Ala Gln Tyr Glu Arg Phe Pro
65      70      75      80

Gly Tyr His Ala Phe Ser Gly His Met Ser Asp Gln Thr Val Met Leu
      85      90      95

Ser Glu Lys Leu Val Glu Val Ser Pro Phe Asp Ser Gly Arg Val Phe
      100     105     110

Tyr Thr Asn Ser Gly Ser Glu Ala Asn Asp Thr Met Val Lys Met Leu
      115     120     125

Trp Phe Leu His Ala Ala Glu Gly Lys Pro Gln Lys Arg Lys Ile Leu
      130     135     140

Thr Arg Trp Asn Ala Tyr His Gly Cys Thr Val Val Ser Ala Ser Met
145     150     155     160

Thr Gly Phe Pro Tyr Asn Ser Val Phe Gly Leu Pro Leu Pro Gly Phe
      165     170     175

Leu His Leu Thr Cys Pro His Tyr Trp Arg Tyr Gly Glu Glu Gly Glu
      180     185     190

Thr Glu Glu Gln Phe Val Ala Arg Leu Ala Arg Glu Leu Glu Glu Thr
      195     200     205

Ile Gln Lys Glu Gly Ala Asp Thr Ile Ala Gly Phe Phe Ala Glu Pro
      210     215     220

Val Met Gly Ala Gly Gly Val Ile Pro Pro Ala Lys Gly Tyr Phe Gln
225     230     235     240

Ala Ile Leu Pro Ile Leu Arg Lys Tyr Asp Ile Pro Val Ile Ser Asp
      245     250     255

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CX2-126USP1_ST25

Glu Val Ile Cys Gly Phe Gly Arg Thr Gly Asn Thr Trp Gly Cys Val
260 265 270

Thr Tyr Asp Phe Thr Pro Asp Ala Ile Ile Ser Ser Lys Asn Leu Thr
275 280 285

Ala Gly Phe Phe Pro Val Gly Ala Val Ile Leu Gly Pro Glu Leu Ser
290 295 300

Lys Arg Leu Glu Thr Ala Ile Glu Ala Ile Gly Glu Phe Pro His Gly
305 310 315 320

Phe Thr Ala Gly Gly His Pro Val Gly Cys Ala Ile Ala Leu Lys Ala
325 330 335

Ile Asp Val Val Met Asn Glu Gly Leu Ala Glu Asn Val Arg Arg Leu
340 345 350

Ala Pro Arg Phe Glu Glu Arg Leu Lys His Ile Ala Glu Arg Pro Asn
355 360 365

Ile Gly Glu Tyr Arg Gly Ile Gly Phe Met Trp Ala Leu Glu Val Val
370 375 380

Lys Asp Lys Ala Ser Lys Ala Pro Phe Asp Gly Asn Leu Ser Val Ser
385 390 395 400

Glu Arg Ile Ala Asn Thr Cys Thr Asp Leu Gly Leu Ile Cys Arg Pro
405 410 415

Thr Gly Gln Ser Val Val Leu Ala Pro Pro Phe Ile Leu Thr Glu Ala
420 425 430

Gln Met Asp Glu Met Phe Asp Lys Leu Glu Lys Ala Leu Asp Lys Val
435 440 445

Phe Ala Glu Val Ala
450

<210> 35
<211> 1359
<212> DNA
<213> Artificial Sequence

<220>
<223> Engineered variant of v. fluvialis transaminase

<400> 35
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catatgccga gcctgcatca gcgtggcacc atggtggtgg cccatggcga agggccgtat 120
atcgtggatg tgcattggccg tcgttatctg gatgcgaaca gcggcgcttt gaacatggtg 180
gcgggctttg atcataaagg cctgattgat gcggcgaaag cgagtatga acgttttccg 240

CX2-126USP1_ST25

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ggctatcatg cgttttcagg ccatatgagc gatcagaccg tgatgctgtc tgaaaaactg      300
gtggaagtga gcccgtttga tagcggccgt gtgttttata ccaacagcgg cagcgaagcg      360
aacgatacca tgggtgaaaat gctgtggttt ctgcatgcgg cggaaggcaa accgcagaaa      420
cgtaaaattc tgacccgttg gaacgcgtat catggctgta ccgtagtgag cgcgagcatg      480
accggctttc cgtataacag cgtgtttggc ctgccgctgc cgggctttct gcatctgacc      540
tgcccgcatt attggcggtta tggcgaagaa ggcgaaaccg aagaacagtt tgtcgcgcgt      600
ctggcccgtg aactggaaga aaccattcag aaggaaggcg cggataccat tgcgggcttt      660
tttgcggaac cgggtgatggg tgctggcggg gttattccgc cggcgaaagg ctattttcag      720
gcgattctga ctatcctgcg caaatatgat attccgggtga tcagcgatga agtgatttgc      780
ggctttggcc gtaccggtaa cacctggggc tgcgtgacct atgattttac cccggatgcg      840
attattagca gtaaaaacct aaccgcgggt ttttttccgg taggcgcggg gattctgggt      900
ccggaactga gcaaactgtc ggaaaccgcg attgaagcga tcggcgaatt tccgcatggt      960
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gaacgtattg cgaacacctg caccgatctg ggctgattt gccgtccgac aggccagagc      1260
gtggttctgt gcccgcggtt tattctgacc gaagcgcaga tggatgaaat gttcgataaa      1320
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<210> 36
 <211> 453
 <212> PRT
 <213> Artificial sequence

<220>
 <223> Engineered variant of v. fluvialis transaminase
 <400> 36

Met Asn Lys Pro Gln Ser Trp Glu Thr Arg Ala Glu Thr Tyr Ser Leu
 1 5 10 15

Tyr Gly Phe Thr His Met Pro Ser Leu His Gln Arg Gly Thr Met Val
 20 25 30

Val Ala His Gly Glu Gly Pro Tyr Ile Val Asp Val His Gly Arg Arg
 35 40 45

Tyr Leu Asp Ala Asn Ser Gly Ala Leu Asn Met Val Ala Gly Phe Asp
 50 55 60

His Lys Gly Leu Ile Asp Ala Ala Lys Ala Gln Tyr Glu Arg Phe Pro
 65 70 75 80

CX2-126USP1_ST25

Gly Tyr His Ala Phe Ser Gly His Met Ser Asp Gln Thr Val Met Leu
 85 90 95
 Ser Glu Lys Leu Val Glu Val Ser Pro Phe Asp Ser Gly Arg Val Phe
 100 105 110
 Tyr Thr Asn Ser Gly Ser Glu Ala Asn Asp Thr Met Val Lys Met Leu
 115 120 125
 Trp Phe Leu His Ala Ala Glu Gly Lys Pro Gln Lys Arg Lys Ile Leu
 130 135 140
 Thr Arg Trp Asn Ala Tyr His Gly Cys Thr Val Val Ser Ala Ser Met
 145 150 155 160
 Thr Gly Phe Pro Tyr Asn Ser Val Phe Gly Leu Pro Leu Pro Gly Phe
 165 170 175
 Leu His Leu Thr Cys Pro His Tyr Trp Arg Tyr Gly Glu Glu Gly Glu
 180 185 190
 Thr Glu Glu Gln Phe Val Ala Arg Leu Ala Arg Glu Leu Glu Glu Thr
 195 200 205
 Ile Gln Lys Glu Gly Ala Asp Thr Ile Ala Gly Phe Phe Ala Glu Pro
 210 215 220
 Val Met Gly Ala Gly Gly Val Ile Pro Pro Ala Lys Gly Tyr Phe Gln
 225 230 235 240
 Ala Ile Leu Thr Ile Leu Arg Lys Tyr Asp Ile Pro Val Ile Ser Asp
 245 250 255
 Glu Val Ile Cys Gly Phe Gly Arg Thr Gly Asn Thr Trp Gly Cys Val
 260 265 270
 Thr Tyr Asp Phe Thr Pro Asp Ala Ile Ile Ser Ser Lys Asn Leu Thr
 275 280 285
 Ala Gly Phe Phe Pro Val Gly Ala Val Ile Leu Gly Pro Glu Leu Ser
 290 295 300
 Lys Arg Leu Glu Thr Ala Ile Glu Ala Ile Gly Glu Phe Pro His Gly
 305 310 315 320
 Phe Thr Ala Gly Gly His Pro Val Gly Cys Ala Ile Ala Leu Lys Ala
 325 330 335
 Ile Asp Val Val Met Asn Glu Gly Leu Ala Glu Asn Val Arg Arg Leu
 340 345 350

CX2-126USP1_ST25

Ala Pro Arg Phe Glu Glu Arg Leu Lys His Ile Ala Glu Arg Pro Asn
355 360 365

Ile Gly Glu Tyr Arg Gly Ile Gly Phe Met Trp Ala Leu Glu Val Val
370 375 380

Lys Asp Lys Ala Ser Lys Ala Pro Phe Asp Gly Asn Leu Ser Val Ser
385 390 395 400

Glu Arg Ile Ala Asn Thr Cys Thr Asp Leu Gly Leu Ile Cys Arg Pro
405 410 415

Thr Gly Gln Ser Val Val Leu Cys Pro Pro Phe Ile Leu Thr Glu Ala
420 425 430

Gln Met Asp Glu Met Phe Asp Lys Leu Glu Lys Ala Leu Asp Lys Val
435 440 445

Phe Ala Glu Val Ala
450

<210> 37
<211> 1359
<212> DNA
<213> Artificial Sequence

<220>
<223> Engineered variant of V. fluvialis transaminase

<400> 37
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atcgtggatg tgcattggcg tcgttatctg gatgcgaaca gcggcgcttt gaacatggtg 180
gcgggctttg atcataaagg cctgattgat gcggcgaaag cgcagtatga acgttttccg 240
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aacgatacca tgggtgaaaat gctgtggttt ctgcatgcgg cggaaggcaa accgcagaaa 420
cgtaaaattc tgaccggtt gaacgcgtat catggctgta ccgtagtgag cgcgagcatg 480
accggctttc cgtataacag cgtgtttggc ctgccgctgc cgggctttct gcatctgacc 540
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ctggcccgtg aactggaaga aaccattcag aagggaaggcg cggataccat tgcgggcttt 660
tttgcggaac cgggtgatggg tgctggcggg gttattccgc cggcgaaagg ctattttcag 720
gcgattctgc cgatcctgcg caaatatgat attccgggtga tcagcgatga agtgatttgc 780
ggctttggcc gtaccggtaa cacctggggc tgcgtgacct atgattttac cccggatgcg 840
attattagca gtaaaaacct aaccgcgggt ttttttccgg taggcgcggg gattctgggt 900

CX2-126USP1_ST25

ccggaactga gcaaacgtct ggaaaccgcg attgaagcga tcggcgaatt tccgcatggt 960
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 atgaacgaag gcctggccga aaacgtgcgt cgtctggccc cgcgttttga agaacgtctg 1080
 aaacatattg cggaacgtcc gaacattggc gaatatcgtg gcattggctt tatgtgggcg 1140
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 gaacgtattg cgaacacctg caccgatctg ggcctgattt gccgtccgac aggccagagc 1260
 gtggttctgt gcccgccgta tattctgacc gaagcgcaga tggatgaaat gttcgataaa 1320
 ctggaaaaag cgctggataa agtgtttgcg gaagtggcg 1359

<210> 38

<211> 453

<212> PRT

<213> Artificial Sequence

<220>

<223> Engineered variant of V. fluvialis transaminase

<400> 38

Met Asn Lys Pro Gln Ser Trp Glu Thr Arg Ala Glu Thr Tyr Ser Leu
 1 5 10 15

Tyr Gly Phe Thr Asp Met Pro Ser Leu His Gln Arg Gly Thr Met Val
 20 25 30

Val Ala His Gly Glu Gly Pro Tyr Ile Val Asp Val His Gly Arg Arg
 35 40 45

Tyr Leu Asp Ala Asn Ser Gly Ala Leu Asn Met Val Ala Gly Phe Asp
 50 55 60

His Lys Gly Leu Ile Asp Ala Ala Lys Ala Gln Tyr Glu Arg Phe Pro
 65 70 75 80

Gly Tyr His Ala Phe Ser Gly His Met Ser Asp Gln Thr Val Met Leu
 85 90 95

Ser Glu Lys Leu Val Glu Val Ser Pro Phe Asp Ser Gly Arg Val Phe
 100 105 110

Tyr Thr Asn Ser Gly Ser Glu Ala Asn Asp Thr Met Val Lys Met Leu
 115 120 125

Trp Phe Leu His Ala Ala Glu Gly Lys Pro Gln Lys Arg Lys Ile Leu
 130 135 140

Thr Arg Trp Asn Ala Tyr His Gly Cys Thr Val Val Ser Ala Ser Met
 145 150 155 160

Thr Gly Phe Pro Tyr Asn Ser Val Phe Gly Leu Pro Leu Pro Gly Phe
 165 170 175
 Leu His Leu Thr Cys Pro His Tyr Trp Arg Tyr Gly Glu Glu Gly Glu
 180 185 190
 Thr Glu Glu Gln Phe Val Ala Arg Leu Ala Arg Glu Leu Glu Glu Thr
 195 200 205
 Ile Gln Lys Glu Gly Ala Asp Thr Ile Ala Gly Phe Phe Ala Glu Pro
 210 215 220
 Val Met Gly Ala Gly Gly Val Ile Pro Pro Ala Lys Gly Tyr Phe Gln
 225 230 235 240
 Ala Ile Leu Pro Ile Leu Arg Lys Tyr Asp Ile Pro Val Ile Ser Asp
 245 250 255
 Glu Val Ile Cys Gly Phe Gly Arg Thr Gly Asn Thr Trp Gly Cys Val
 260 265 270
 Thr Tyr Asp Phe Thr Pro Asp Ala Ile Ile Ser Ser Lys Asn Leu Thr
 275 280 285
 Ala Gly Phe Phe Pro Val Gly Ala Val Ile Leu Gly Pro Glu Leu Ser
 290 295 300
 Lys Arg Leu Glu Thr Ala Ile Glu Ala Ile Gly Glu Phe Pro His Gly
 305 310 315 320
 Phe Thr Ala Gly Gly His Pro Val Gly Cys Ala Ile Ala Leu Lys Ala
 325 330 335
 Ile Asp Val Val Met Asn Glu Gly Leu Ala Glu Asn Val Arg Arg Leu
 340 345 350
 Ala Pro Arg Phe Glu Glu Arg Leu Lys His Ile Ala Glu Arg Pro Asn
 355 360 365
 Ile Gly Glu Tyr Arg Gly Ile Gly Phe Met Trp Ala Leu Glu Val Val
 370 375 380
 Lys Asp Lys Ala Ser Lys Ala Pro Phe Asp Gly Asn Leu Ser Val Ser
 385 390 395 400
 Glu Arg Ile Ala Asn Thr Cys Thr Asp Leu Gly Leu Ile Cys Arg Pro
 405 410 415
 Thr Gly Gln Ser Val Val Leu Cys Pro Pro Tyr Ile Leu Thr Glu Ala
 420 425 430

CX2-126USP1_ST25

Gln Met Asp Glu Met Phe Asp Lys Leu Glu Lys Ala Leu Asp Lys Val
 435 440 445

Phe Ala Glu Val Ala
 450

<210> 39
 <211> 1359
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Engineered variant of v. fluvialis transaminase

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<400> 39
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gatatgccga gcctgcatca gcgtggcacc atggtggtgg cccatggcga agggccgtat      120
atcgtggatg tgcattggcg tcgttatctg gatgcgaaca gcggcgcttt gaacatgggtg      180
gcgggctttg atcataaagg cctgattgat gcggcgaaaag cgcagtatga acgttttccg      240
ggctatcatg cgttttcagg ccatatgagc gatcagaccg tgatgctgtc tgaaaaactg      300
gtggaagtga gcccgtttga tagcggccgt gtgttttata ccaacagcgg cagcgaagcg      360
aacgatacca tgggtgaaaat gctgtggttt ctgcatgcgg cggaaggcaa accgcagaaa      420
cgtaaaattc tgaccctgtg gaacgcgtat catggctgta ccgtagtgag cgcgagcatg      480
accggctttc cgtataacag cgtgtttggc ctgccgctgc cgggctttct gcattctgacc      540
tgcccgcatt attggcggtt tggcgaagaa ggcgaaaccg aagaacagtt tgtcgcgcgt      600
ctggcccgtg aactggaaga aaccattcag aaggaaaggcg cggataccat tgcgggcttt      660
tttgcggaac cgggtgatggg tgctggcggt gttattacac cggcgaaagg ctattttcag      720
gcgattctgc cgatcctgcg caaatatgat attccggtga tcagcgatga agtgatttgc      780
ggctttggcc gtaccggtaa cacctggggc tgcgtgacct atgattttac cccggatgcg      840
attattagca gtaaaaacct aaccgcgggt ttttttccgg taggcgcggt gattctgggt      900
ccggaactga gcaaactgtt ggaaaccgcg attgaagcga tcggcgaatt tccgcattgt      960
tttaccgcgg gcggccatcc ggtgggttgt gcgattgcgc tgaaagcgat tgatgtggtg     1020
atgaacgaag gcctggccga aaacgtgcgt cgtctggccc cgcgttttga agaactctg     1080
aaacatattg cggaactgcc gaacattggc gaatatcgtg gcattggctt tatgtgggcg     1140
ctggaagtcg tgaaagataa agcgagcaaa gccccgtttg atggcaacct gagcgtgagc     1200
gaacgtattg cgaacacctg caccgatctg ggcctgattt gccgtccgac aggccagagc     1260
gtggttctgg caccgccgtt tattctgacc gaagcgcaga tggatgaaat gttcgataaa     1320
ctggaaaaag cgctggataa agtggttgcg gaagtggcg      1359
  
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<210> 40
 <211> 453
 <212> PRT
 <213> Artificial Sequence

CX2-126USP1_ST25

<220>

<223> Engineered variant of V. fluvialis transaminase

<400> 40

Met Asn Lys Pro Gln Ser Trp Glu Thr Arg Ala Glu Thr Tyr Ser Leu
1 5 10 15

Tyr Gly Phe Thr Asp Met Pro Ser Leu His Gln Arg Gly Thr Met Val
20 25 30

Val Ala His Gly Glu Gly Pro Tyr Ile Val Asp Val His Gly Arg Arg
35 40 45

Tyr Leu Asp Ala Asn Ser Gly Ala Leu Asn Met Val Ala Gly Phe Asp
50 55 60

His Lys Gly Leu Ile Asp Ala Ala Lys Ala Gln Tyr Glu Arg Phe Pro
65 70 75 80

Gly Tyr His Ala Phe Ser Gly His Met Ser Asp Gln Thr Val Met Leu
85 90 95

Ser Glu Lys Leu Val Glu Val Ser Pro Phe Asp Ser Gly Arg Val Phe
100 105 110

Tyr Thr Asn Ser Gly Ser Glu Ala Asn Asp Thr Met Val Lys Met Leu
115 120 125

Trp Phe Leu His Ala Ala Glu Gly Lys Pro Gln Lys Arg Lys Ile Leu
130 135 140

Thr Arg Trp Asn Ala Tyr His Gly Cys Thr Val Val Ser Ala Ser Met
145 150 155 160

Thr Gly Phe Pro Tyr Asn Ser Val Phe Gly Leu Pro Leu Pro Gly Phe
165 170 175

Leu His Leu Thr Cys Pro His Tyr Trp Arg Tyr Gly Glu Glu Gly Glu
180 185 190

Thr Glu Glu Gln Phe Val Ala Arg Leu Ala Arg Glu Leu Glu Glu Thr
195 200 205

Ile Gln Lys Glu Gly Ala Asp Thr Ile Ala Gly Phe Phe Ala Glu Pro
210 215 220

Val Met Gly Ala Gly Gly Val Ile Thr Pro Ala Lys Gly Tyr Phe Gln
225 230 235 240

Ala Ile Leu Pro Ile Leu Arg Lys Tyr Asp Ile Pro Val Ile Ser Asp
245 250 255

CX2-126USP1_ST25

Glu Val Ile Cys Gly Phe Gly Arg Thr Gly Asn Thr Trp Gly Cys Val
260 265 270

Thr Tyr Asp Phe Thr Pro Asp Ala Ile Ile Ser Ser Lys Asn Leu Thr
275 280 285

Ala Gly Phe Phe Pro Val Gly Ala Val Ile Leu Gly Pro Glu Leu Ser
290 295 300

Lys Arg Leu Glu Thr Ala Ile Glu Ala Ile Gly Glu Phe Pro His Gly
305 310 315 320

Phe Thr Ala Gly Gly His Pro Val Gly Cys Ala Ile Ala Leu Lys Ala
325 330 335

Ile Asp Val Val Met Asn Glu Gly Leu Ala Glu Asn Val Arg Arg Leu
340 345 350

Ala Pro Arg Phe Glu Glu Arg Leu Lys His Ile Ala Glu Arg Pro Asn
355 360 365

Ile Gly Glu Tyr Arg Gly Ile Gly Phe Met Trp Ala Leu Glu Val Val
370 375 380

Lys Asp Lys Ala Ser Lys Ala Pro Phe Asp Gly Asn Leu Ser Val Ser
385 390 395 400

Glu Arg Ile Ala Asn Thr Cys Thr Asp Leu Gly Leu Ile Cys Arg Pro
405 410 415

Thr Gly Gln Ser Val Val Leu Ala Pro Pro Phe Ile Leu Thr Glu Ala
420 425 430

Gln Met Asp Glu Met Phe Asp Lys Leu Glu Lys Ala Leu Asp Lys Val
435 440 445

Phe Ala Glu Val Ala
450

<210> 41
<211> 1359
<212> DNA
<213> Artificial Sequence

<220>
<223> Engineered variant of V. fluvialis transaminase

<400> 41
atgaacaaac cgcagagctg ggaaacgcgt gcggaaacct atagcctgta tgggtttacc 60
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atcgtggatg tgcattggccg tcgttatctg gatgcgaaca gcggcgcttt gaacatggtg 180

CX2-126USP1_ST25

gcgggctttg atcataaagg cctgattgat gcggcgaaaag cgcagtatga acgtttttccg 240
 ggctatcatg cgtttttcagg ccatatgagc gatcagaccg tgatgctgtc tgaaaaactg 300
 gtggaagtga gcccgtttga tagcggccgt gtgtttttata ccaacagcgg cagcgaagcg 360
 aacgatacca tgggtgaaaat gctgtggttt ctgcatgcgg cggaaggcaa accgcagaaa 420
 cgtaaaattc tgacctgtg gaacgcgtat catggctgta ccgtagtgag cgcgagcatg 480
 accggctttc cgtataacag cgtgtttggc ctgccgctgc cgggctttct gcatctgacc 540
 tgcccgcat attggcgta tggcgaagaa ggcgaaaccg aagaacagtt tgcgcgcgt 600
 ctggcccgtg aactggaaga aaccattcag aaggaaaggc cgataccat tgcgggcttt 660
 tttgcggaac cgggtgatggg tgctggcggg gttattacac cggcgaaagg ctattttcag 720
 gcgattctgc cgatcctgcg caaatatgat attccggtga tcagcgatga agtgatttgc 780
 ggctttggcc gtaccggtaa cacctggggc tgcgtgacct atgattttac cccggatgcg 840
 attattagca gtaaaaacct aaccgcgggt ttttttccgg taggcgcggg gattctgggt 900
 ccggaactga gcaaactct ggaaaccgcg attgaagcga tcggcgaatt tccgcatggt 960
 tttaccgcgg gcggccatcc ggtgggttgt gcgattgcgc tgaaagcgat tgatgtggtg 1020
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 aaacatattg cggaactcc gaacattggc gaatatcgtg gcattggctt tatgtggcg 1140
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 gaacgtattg cgaacacctg caccgatctg ggcctgattt gccgtccgac aggccagagc 1260
 gtggttctgt gcccgcggt tattctgacc gaagcgcaga tggatgaaat gttcgataaa 1320
 ctggaaaaag cgctggataa agtgtttgcg gaagtggcg 1359

<210> 42
 <211> 453
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> Engineered variant of V. fluvialis transaminase

<400> 42

Met Asn Lys Pro Gln Ser Trp Glu Thr Arg Ala Glu Thr Tyr Ser Leu
 1 5 10 15

Tyr Gly Phe Thr His Met Pro Ser Leu His Gln Arg Gly Thr Met Val
 20 25 30

Val Ala His Gly Glu Gly Pro Tyr Ile Val Asp Val His Gly Arg Arg
 35 40 45

Tyr Leu Asp Ala Asn Ser Gly Ala Leu Asn Met Val Ala Gly Phe Asp
 50 55 60

CX2-126USP1_ST25

His Lys Gly Leu Ile Asp Ala Ala Lys Ala Gln Tyr Glu Arg Phe Pro
 65 70 75 80
 Gly Tyr His Ala Phe Ser Gly His Met Ser Asp Gln Thr Val Met Leu
 85 90 95
 Ser Glu Lys Leu Val Glu Val Ser Pro Phe Asp Ser Gly Arg Val Phe
 100 105 110
 Tyr Thr Asn Ser Gly Ser Glu Ala Asn Asp Thr Met Val Lys Met Leu
 115 120 125
 Trp Phe Leu His Ala Ala Glu Gly Lys Pro Gln Lys Arg Lys Ile Leu
 130 135 140
 Thr Leu Trp Asn Ala Tyr His Gly Cys Thr Val Val Ser Ala Ser Met
 145 150 155 160
 Thr Gly Phe Pro Tyr Asn Ser Val Phe Gly Leu Pro Leu Pro Gly Phe
 165 170 175
 Leu His Leu Thr Cys Pro His Tyr Trp Arg Tyr Gly Glu Glu Gly Glu
 180 185 190
 Thr Glu Glu Gln Phe Val Ala Arg Leu Ala Arg Glu Leu Glu Glu Thr
 195 200 205
 Ile Gln Lys Glu Gly Ala Asp Thr Ile Ala Gly Phe Phe Ala Glu Pro
 210 215 220
 Val Met Gly Ala Gly Gly Val Ile Thr Pro Ala Lys Gly Tyr Phe Gln
 225 230 235 240
 Ala Ile Leu Pro Ile Leu Arg Lys Tyr Asp Ile Pro Val Ile Ser Asp
 245 250 255
 Glu Val Ile Cys Gly Phe Gly Arg Thr Gly Asn Thr Trp Gly Cys Val
 260 265 270
 Thr Tyr Asp Phe Thr Pro Asp Ala Ile Ile Ser Ser Lys Asn Leu Thr
 275 280 285
 Ala Gly Phe Phe Pro Val Gly Ala Val Ile Leu Gly Pro Glu Leu Ser
 290 295 300
 Lys Arg Leu Glu Thr Ala Ile Glu Ala Ile Gly Glu Phe Pro His Gly
 305 310 315 320
 Phe Thr Ala Gly Gly His Pro Val Gly Cys Ala Ile Ala Leu Lys Ala
 325 330 335

CX2-126USP1_ST25

Ile Asp Val Val Met Asn Glu Gly Leu Ala Glu Asn Val Arg Arg Leu
340 345 350

Ala Pro Arg Phe Glu Glu Arg Leu Lys His Ile Ala Glu Arg Pro Asn
355 360 365

Ile Gly Glu Tyr Arg Gly Ile Gly Phe Met Trp Ala Leu Glu Val Val
370 375 380

Lys Asp Lys Ala Ser Lys Ala Pro Phe Asp Gly Asn Leu Ser Val Ser
385 390 395 400

Glu Arg Ile Ala Asn Thr Cys Thr Asp Leu Gly Leu Ile Cys Arg Pro
405 410 415

Thr Gly Gln Ser Val Val Leu Cys Pro Pro Phe Ile Leu Thr Glu Ala
420 425 430

Gln Met Asp Glu Met Phe Asp Lys Leu Glu Lys Ala Leu Asp Lys Val
435 440 445

Phe Ala Glu Val Ala
450

<210> 43
<211> 1359
<212> DNA
<213> Artificial Sequence

<220>
<223> Engineered variant of v. fluvialis transaminase

<400> 43
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atcgtggatg tgcattggcg tcgttatctg gatgcgaaca gcggcgcttt gaacatgggtg 180
gcgggctttg atcataaagg cctgattgat gcggcgaaaag cgcagtatga acgttttccg 240
ggctatcatg cgttttcagg ccatatgagc gatcagaccg tgatgctgtc tgaaaaactg 300
gtggaagtga gcccgtttga tagcggccgt gtgttttata ccaacagcgg cagcgaagcg 360
aacgatacca tgggtgaaaat gctgtggttt ctgcatgcgg cggaaggcaa accgcagaaa 420
cgtaaaattc tgaccgcgtg gaacgcgtat catggctgta ccgtagtgag cgcgagcatg 480
accggctttc cgtataacag cgtgtttggc ctgccgctgc cgggctttct gcatctgacc 540
tgcccgcatc attggcggtt tggcgaagaa ggcgaaaccg aagaacagtt tgtcgcgcgt 600
ctggcccgtg aactggaaga aaccattcag aaggaaaggcg cggataccat tgcgggcttt 660
tttgcggaac cggatgatggg tgctggcggg gttattccgc cggcgaaagg ctattttcag 720
gcgattctgc cgatcctgcg caaatatgat attccggtga tcagcgatga agtgatttgc 780
ggctttggcc gtaccggtaa cacctggggc tgcgtgacct atgattttac cccggatgcg 840

CX2-126USP1_ST25

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 ccggaactga gcaaactgtct ggaaaccgcg attgaagcga tcggcgaatt tccgcatggt 960
 tttaccgcgg gcggccatcc ggtgggttgt gcgattgcgc tgaaagcgat tgatgtgggt 1020
 atgaacgaag gcctggccga aaacgtgcgt cgtctggccc cgcgttttga agaactgtctg 1080
 aaacatatattg cggaacgtcc gaacattggc gaatatcgtg gcattggcctt tatgtgggcg 1140
 ctggaagtcg tgaaagataa agcgagcaaa gccccgtttg atggcaacct gagcgtgagc 1200
 gaacgtattg cgaacacctg caccgatctg ggctgattt gccgtccgac aggccagagc 1260
 gtggttctgt gcccgcggtt tattctgacc gaagcgcaga tggatgaaat gttcgataaa 1320
 ctggaaaaag cgctggataa agtgtttgcg gaagtggcg 1359

<210> 44
 <211> 453
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> Engineered variant of V. fluvialis transaminase
 <400> 44

Met Asn Lys Pro Gln Ser Trp Glu Thr Arg Ala Glu Thr Tyr Ser Leu
 1 5 10 15

Tyr Gly Phe Thr Asp Met Pro Ser Leu His Gln Arg Gly Thr Met Val
 20 25 30

Val Ala His Gly Glu Gly Pro Tyr Ile Val Asp Val His Gly Arg Arg
 35 40 45

Tyr Leu Asp Ala Asn Ser Gly Ala Leu Asn Met Val Ala Gly Phe Asp
 50 55 60

His Lys Gly Leu Ile Asp Ala Ala Lys Ala Gln Tyr Glu Arg Phe Pro
 65 70 75 80

Gly Tyr His Ala Phe Ser Gly His Met Ser Asp Gln Thr Val Met Leu
 85 90 95

Ser Glu Lys Leu Val Glu Val Ser Pro Phe Asp Ser Gly Arg Val Phe
 100 105 110

Tyr Thr Asn Ser Gly Ser Glu Ala Asn Asp Thr Met Val Lys Met Leu
 115 120 125

Trp Phe Leu His Ala Ala Glu Gly Lys Pro Gln Lys Arg Lys Ile Leu
 130 135 140

Thr Arg Trp Asn Ala Tyr His Gly Cys Thr Val Val Ser Ala Ser Met
 145 150 155 160

CX2-126USP1_ST25

Thr Gly Phe Pro Tyr 165 Asn Ser Val Phe Gly 170 Leu Pro Leu Pro Gly 175 Phe
 Leu His Leu Thr 180 Cys Pro His Tyr Trp 185 Arg Tyr Gly Glu Glu 190 Gly Glu
 Thr Glu Glu 195 Gln Phe Val Ala Arg 200 Leu Ala Arg Glu Leu 205 Glu Glu Thr
 Ile Gln 210 Lys Glu Gly Ala Asp 215 Thr Ile Ala Gly Phe 220 Phe Ala Glu Pro
 Val 225 Met Gly Ala Gly Gly 230 Val Ile Pro Pro Ala 235 Lys Gly Tyr Phe Gln 240
 Ala Ile Leu Pro Ile 245 Leu Arg Lys Tyr Asp 250 Ile Pro Val Ile Ser 255 Asp
 Glu Val Ile Cys 260 Gly Phe Gly Arg Thr 265 Gly Asn Thr Trp Gly 270 Cys Val
 Thr Tyr Asp 275 Phe Thr Pro Asp Ala 280 Ile Ile Ser Ser Lys 285 Asn Leu Thr
 Ala Gly 290 Phe Phe Pro Val Gly 295 Ala Val Ile Leu Gly 300 Pro Glu Leu Ser
 Lys 305 Arg Leu Glu Thr Ala 310 Ile Glu Ala Ile Gly 315 Glu Phe Pro His Gly 320
 Phe Thr Ala Gly Gly 325 His Pro Val Gly Cys 330 Ala Ile Ala Leu Lys 335 Ala
 Ile Asp Val Val 340 Met Asn Glu Gly Leu 345 Ala Glu Asn Val Arg 350 Arg Leu
 Ala Pro Arg 355 Phe Glu Glu Arg Leu 360 Lys His Ile Ala Glu 365 Arg Pro Asn
 Ile Gly 370 Glu Tyr Arg Gly Ile 375 Gly Phe Met Trp Ala 380 Leu Glu Val Val
 Lys 385 Asp Lys Ala Ser Lys 390 Ala Pro Phe Asp Gly 395 Asn Leu Ser Val Ser 400
 Glu Arg Ile Ala Asn 405 Thr Cys Thr Asp Leu 410 Gly Leu Ile Cys Arg 415 Pro
 Thr Gly Gln Ser 420 Val Val Leu Cys Pro 425 Pro Phe Ile Leu Thr 430 Glu Ala

CX2-126USP1_ST25

Gln Met Asp Glu Met Phe Asp Lys Leu Glu Lys Ala Leu Asp Lys Val
 435 440 445

Phe Ala Glu Val Ala
 450

<210> 45
 <211> 1359
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Engineered variant of V. fluvialis transaminase

<400> 45
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 atcgtggatg tgcattggccg tcgttatctg gatgcgaaca gcggcgcttt gaacatggtg 180
 gcgggctttg atcataaagg cctgattgat gcggcgaaag cgcagtatga acgttttccg 240
 ggctatcatg cgttttcagg ccatatgagc gatcagaccg tgatgctgtc tgaaaaactg 300
 gtggaagtga gcccgtttga tagcggccgt gtgttttata ccaacagcgg cagcgaagcg 360
 aacgatacca tgggtgaaaat gctgtggttt ctgcatgcgg cggaaggcaa accgcagaaa 420
 cgtaaaattc tgaccgcgtg gaacgcgtat catggctgta ccgtagtgag cgcgagcatg 480
 accggctttc cgtataacag cgtgtttggc ctgccgctgc cgggctttct gcattctgacc 540
 tgcccgcatt attggcggtt tggcgaagaa ggcgaaaccg aagaacagtt tgcgcgcgt 600
 ctggcccgtg aactggaaga aaccattcag aagggaaggc cggaaccat tcggggcttt 660
 tttgcggaac cgggtgatggg tgctggcggg gttattccgc cggcgaaaagg ctattttcag 720
 gcgattctga ctatcctgcg caaatatgat attccgggtg tcagcgatga agtgatttgc 780
 ggctttggcc gtaccggtta cacctggggc tgcgtgacct atgattttac cccggatgcg 840
 attattagca gtaaaaacct aaccgcgggt ttttttccgg taggcgcggg gattctgggt 900
 ccggaactga gcaaacgtct ggaaaccgcg attgaagcga tcggcgaatt tccgcatggt 960
 tttaccgcgg gcggccatcc ggtgggttgt gcgattgcgc tgaaagcgat tgatgtggtg 1020
 atgaacgaag gcctggccga aaacgtgcgt cgtctggccc cgcgttttga agaacgtctg 1080
 aaacatattg cggaacgtcc gaacattggc gaatatcgtg gcattggctt tatgtgggcg 1140
 ctggaagtcg tgaaagataa agcgagcaaa gcccgtttg atggcaacct gagcgtgagc 1200
 gaacgtattg cgaacacctg caccgatctg ggcctgattt gccgtccgac aggccagagc 1260
 gtggttctgt gcccgcggtt tattctgacc gaagcgcaga tggatgaaat gttcgataaa 1320
 ctggaaaaag cgctggataa agtggtttgcg gaagtggcg 1359

<210> 46
 <211> 453

<212> PRT

<213> Artificial Sequence

<220>

<223> Engineered variant of *V. fluvialis* transaminase

<400> 46

Met Asn Lys Pro Gln Ser Trp Glu Thr Arg Ala Glu Thr Tyr Ser Leu
 1 5 10 15

Tyr Gly Phe Thr Asp Met Pro Ser Leu His Gln Arg Gly Thr Met Val
 20 25 30

Val Ala His Gly Glu Gly Pro Tyr Ile Val Asp Val His Gly Arg Arg
 35 40 45

Tyr Leu Asp Ala Asn Ser Gly Ala Leu Asn Met Val Ala Gly Phe Asp
 50 55 60

His Lys Gly Leu Ile Asp Ala Ala Lys Ala Gln Tyr Glu Arg Phe Pro
 65 70 75 80

Gly Tyr His Ala Phe Ser Gly His Met Ser Asp Gln Thr Val Met Leu
 85 90 95

Ser Glu Lys Leu Val Glu Val Ser Pro Phe Asp Ser Gly Arg Val Phe
 100 105 110

Tyr Thr Asn Ser Gly Ser Glu Ala Asn Asp Thr Met Val Lys Met Leu
 115 120 125

Trp Phe Leu His Ala Ala Glu Gly Lys Pro Gln Lys Arg Lys Ile Leu
 130 135 140

Thr Arg Trp Asn Ala Tyr His Gly Cys Thr Val Val Ser Ala Ser Met
 145 150 155 160

Thr Gly Phe Pro Tyr Asn Ser Val Phe Gly Leu Pro Leu Pro Gly Phe
 165 170 175

Leu His Leu Thr Cys Pro His Tyr Trp Arg Tyr Gly Glu Glu Gly Glu
 180 185 190

Thr Glu Glu Gln Phe Val Ala Arg Leu Ala Arg Glu Leu Glu Glu Thr
 195 200 205

Ile Gln Lys Glu Gly Ala Asp Thr Ile Ala Gly Phe Phe Ala Glu Pro
 210 215 220

Val Met Gly Ala Gly Gly Val Ile Pro Pro Ala Lys Gly Tyr Phe Gln
 225 230 235 240

CX2-126USP1_ST25

Ala Ile Leu Thr Ile Leu Arg Lys Tyr Asp Ile Pro Val Ile Ser Asp
245 250 255

Glu Val Ile Cys Gly Phe Gly Arg Thr Gly Asn Thr Trp Gly Cys Val
260 265 270

Thr Tyr Asp Phe Thr Pro Asp Ala Ile Ile Ser Ser Lys Asn Leu Thr
275 280 285

Ala Gly Phe Phe Pro Val Gly Ala Val Ile Leu Gly Pro Glu Leu Ser
290 295 300

Lys Arg Leu Glu Thr Ala Ile Glu Ala Ile Gly Glu Phe Pro His Gly
305 310 315 320

Phe Thr Ala Gly Gly His Pro Val Gly Cys Ala Ile Ala Leu Lys Ala
325 330 335

Ile Asp Val Val Met Asn Glu Gly Leu Ala Glu Asn Val Arg Arg Leu
340 345 350

Ala Pro Arg Phe Glu Glu Arg Leu Lys His Ile Ala Glu Arg Pro Asn
355 360 365

Ile Gly Glu Tyr Arg Gly Ile Gly Phe Met Trp Ala Leu Glu Val Val
370 375 380

Lys Asp Lys Ala Ser Lys Ala Pro Phe Asp Gly Asn Leu Ser Val Ser
385 390 395 400

Glu Arg Ile Ala Asn Thr Cys Thr Asp Leu Gly Leu Ile Cys Arg Pro
405 410 415

Thr Gly Gln Ser Val Val Leu Cys Pro Pro Phe Ile Leu Thr Glu Ala
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Gln Met Asp Glu Met Phe Asp Lys Leu Glu Lys Ala Leu Asp Lys Val
435 440 445

Phe Ala Glu Val Ala
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<210> 47
<211> 1359
<212> DNA
<213> Artificial Sequence

<220>
<223> Engineered variant of v. fluvialis transaminase

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gatatgccga gcctgcatca gcgtggcacc atggtggtgg cccatggcga aggcccgat 120
Page 62

CX2-126USP1_ST25

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ggctatcatg cgttttccagg ccatatgagc gatcagaccg tgatgctgtc tgaaaaactg      300
gtggaagtga gcccgtttga tagcggccgt gtgttttata ccaacagcgg cagcgaagcg      360
aacgatacca tgggtgaaaat gctgtgggtt ctgcatgcgg cggaaggcaa accgcagaaa      420
cgtaaaattc tgaccctgtg gaacgcgtat catggctgta ccgtagtgag cgcgagcatg      480
accggctttc cgtataacag cgtgtttggc ctgccgctgc cgggctttct gcatctgacc      540
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<210> 48

<211> 453

<212> PRT

<213> Artificial Sequence

<220>

<223> Engineered variant of V. fluvialis transaminase

<400> 48

Met Asn Lys Pro Gln Ser Trp Glu Thr Arg Ala Glu Thr Tyr Ser Leu
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Tyr Gly Phe Thr Asp Met Pro Ser Leu His Gln Arg Gly Thr Met Val
20 25 30

Val Ala His Gly Glu Gly Pro Tyr Ile Val Asp Val His Gly Arg Arg
35 40 45

Tyr Leu Asp Ala Asn Ser Gly Ala Leu Asn Met Val Ala Gly Phe Asp
50 55 60

CX2-126USP1_ST25

His Lys Gly Leu Ile Asp Ala Ala Lys Ala Gln Tyr Glu Arg Phe Pro
 65 70 75 80
 Gly Tyr His Ala Phe Ser Gly His Met Ser Asp Gln Thr Val Met Leu
 85 90 95
 Ser Glu Lys Leu Val Glu Val Ser Pro Phe Asp Ser Gly Arg Val Phe
 100 105 110
 Tyr Thr Asn Ser Gly Ser Glu Ala Asn Asp Thr Met Val Lys Met Leu
 115 120 125
 Trp Phe Leu His Ala Ala Glu Gly Lys Pro Gln Lys Arg Lys Ile Leu
 130 135 140
 Thr Leu Trp Asn Ala Tyr His Gly Cys Thr Val Val Ser Ala Ser Met
 145 150 155 160
 Thr Gly Phe Pro Tyr Asn Ser Val Phe Gly Leu Pro Leu Pro Gly Phe
 165 170 175
 Leu His Leu Thr Cys Pro His Tyr Trp Arg Tyr Gly Glu Glu Gly Glu
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 Thr Glu Glu Gln Phe Val Ala Arg Leu Ala Arg Glu Leu Glu Glu Thr
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 Ile Gln Lys Glu Gly Ala Asp Thr Ile Ala Gly Phe Phe Ala Glu Pro
 210 215 220
 Val Met Gly Ala Gly Gly Val Ile Thr Pro Pro Lys Gly Tyr Phe Gln
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 Ala Ile Leu Thr Ile Leu Arg Lys Tyr Asp Ile Pro Val Ile Ser Asp
 245 250 255
 Glu Val Ile Cys Gly Phe Gly Arg Thr Gly Asn Thr Trp Gly Cys Val
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 Thr Tyr Asp Phe Thr Pro Asp Ala Ile Ile Ser Ser Lys Asn Leu Thr
 275 280 285
 Ala Gly Phe Phe Pro Val Gly Ala Val Ile Leu Gly Pro Glu Leu Ser
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 Lys Arg Leu Glu Thr Ala Ile Glu Ala Ile Gly Glu Phe Pro His Gly
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 Phe Thr Ala Gly Gly His Pro Val Gly Cys Ala Ile Ala Leu Lys Ala
 325 330 335

CX2-126USP1_ST25

Ile Asp Val Val Met Asn Glu Gly Leu Ala Glu Asn Val Arg Arg Leu
340 345 350

Ala Pro Arg Phe Glu Glu Arg Leu Lys His Ile Ala Glu Arg Pro Asn
355 360 365

Ile Gly Glu Tyr Arg Gly Ile Gly Phe Met Trp Ala Leu Glu Val Val
370 375 380

Lys Asp Lys Ala Ser Lys Ala Pro Phe Asp Gly Asn Leu Ser Val Ser
385 390 395 400

Glu Arg Ile Ala Asn Thr Cys Thr Asp Leu Gly Leu Ile Cys Arg Pro
405 410 415

Thr Gly Gln Ser Val Val Leu Ala Pro Pro Tyr Ile Leu Thr Glu Ala
420 425 430

Gln Met Asp Glu Met Phe Asp Lys Leu Glu Lys Ala Leu Asp Lys Val
435 440 445

Phe Ala Glu Val Ala
450

<210> 49
<211> 1359
<212> DNA
<213> Artificial sequence

<220>
<223> Engineered variant of v. fluvialis transaminase

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gcgggctttg atcataaagg cctgattgat gcggcgaaag cgcagtatga acgttttccg 240
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cgtaaaattc tgaccggttg gaacgcgtat catggctgta ccgtagtgag cgcgagcatg 480
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CX2-126USP1_ST25

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<210> 50
 <211> 453
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> Engineered variant of V. fluvialis transaminase
 <400> 50

Met Asn Lys Pro Gln Ser Trp Glu Thr Arg Ala Glu Thr Tyr Ser Leu
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Tyr Gly Phe Thr Asp Met Pro Ser Leu His Gln Arg Gly Thr Met Val
20 25 30

Val Ala His Gly Glu Gly Pro Tyr Ile Val Asp Val His Gly Arg Arg
35 40 45

Tyr Leu Asp Ala Asn Ser Gly Ala Leu Asn Met Val Ala Gly Phe Asp
50 55 60

His Lys Gly Leu Ile Asp Ala Ala Lys Ala Gln Tyr Glu Arg Phe Pro
65 70 75 80

Gly Tyr His Ala Phe Ser Gly His Met Ser Asp Gln Thr Val Met Leu
85 90 95

Ser Glu Lys Leu Val Glu Val Ser Pro Phe Asp Ser Gly Arg Val Phe
100 105 110

Tyr Thr Asn Ser Gly Ser Glu Ala Asn Asp Thr Met Val Lys Met Leu
115 120 125

Trp Phe Leu His Ala Ala Glu Gly Lys Pro Gln Lys Arg Lys Ile Leu
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CX2-126USP1_ST25

Thr Arg Trp Asn Ala Tyr His Gly Cys Thr Val Val Ser Ala Ser Met
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Thr Gly Phe Pro Tyr Asn Ser Val Phe Gly Leu Pro Leu Pro Gly Phe
165 170 175

Leu His Leu Thr Cys Pro His Tyr Trp Arg Tyr Gly Glu Glu Gly Glu
180 185 190

Thr Glu Glu Gln Phe Val Ala Arg Leu Ala Arg Glu Leu Glu Glu Thr
195 200 205

Ile Gln Lys Glu Gly Ala Asp Thr Ile Ala Gly Phe Phe Ala Glu Pro
210 215 220

Val Met Gly Ala Gly Gly Val Ile Pro Pro Ala Lys Gly Tyr Phe Gln
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Ala Ile Leu Pro Ile Leu Arg Lys Tyr Asp Ile Pro Val Ile Ser Asp
245 250 255

Glu Val Ile Cys Gly Phe Gly Arg Thr Gly Asn Thr Trp Gly Cys Val
260 265 270

Thr Tyr Asp Phe Thr Pro Asp Ala Ile Ile Ser Ser Lys Asn Leu Thr
275 280 285

Ala Gly Phe Phe Pro Val Gly Ala Val Ile Leu Gly Pro Glu Leu Ser
290 295 300

Lys Arg Leu Glu Thr Ala Ile Glu Ala Ile Gly Glu Phe Pro His Gly
305 310 315 320

Phe Thr Ala Gly Gly His Pro Val Gly Cys Ala Ile Ala Leu Lys Ala
325 330 335

Ile Asp Val Val Met Asn Glu Gly Leu Ala Glu Asn Val Arg Arg Leu
340 345 350

Ala Pro Arg Phe Glu Glu Arg Leu Lys His Ile Ala Glu Arg Pro Asn
355 360 365

Ile Gly Glu Tyr Arg Gly Ile Gly Phe Met Trp Ala Leu Glu Val Val
370 375 380

Lys Asp Lys Ala Ser Lys Ala Pro Phe Asp Gly Asn Leu Ser Val Ser
385 390 395 400

Glu Arg Ile Ala Asn Thr Cys Thr Asp Leu Gly Leu Ile Cys Arg Pro
405 410 415

CX2-126USP1_ST25

Thr Gly Gln Ser Val Val Leu Ala Pro Pro Tyr Ile Leu Thr Glu Ala
420 425 430

Gln Met Asp Glu Met Phe Asp Lys Leu Glu Lys Ala Leu Asp Lys Val
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Phe Ala Glu Val Ala
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<210> 51
<211> 1359
<212> DNA
<213> Artificial Sequence

<220>
<223> Engineered variant of *V. fluvialis* transaminase

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CX2-126USP1_ST25

<210> 52
 <211> 453
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> Engineered variant of *V. fluvialis* transaminase

<400> 52

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Tyr Gly Phe Thr Asp Met Pro Ser Leu His Gln Arg Gly Thr Met Val
 20 25 30

Val Ala His Gly Glu Gly Pro Tyr Ile Val Asp Val His Gly Arg Arg
 35 40 45

Tyr Leu Asp Ala Asn Ser Gly Ala Leu Asn Met Val Ala Gly Phe Asp
 50 55 60

His Lys Gly Leu Ile Asp Ala Ala Lys Ala Gln Tyr Glu Arg Phe Pro
 65 70 75 80

Gly Tyr His Ala Phe Ser Gly His Met Ser Asp Gln Thr Val Met Leu
 85 90 95

Ser Glu Lys Leu Val Glu Val Ser Pro Phe Asp Ser Gly Arg Val Phe
 100 105 110

Tyr Thr Asn Ser Gly Ser Glu Ala Asn Asp Thr Met Val Lys Met Leu
 115 120 125

Trp Phe Leu His Ala Ala Glu Gly Lys Pro Gln Lys Arg Lys Ile Leu
 130 135 140

Thr Arg Trp Asn Ala Tyr His Gly Cys Thr Val Val Ser Ala Ser Met
 145 150 155 160

Thr Gly Phe Pro Tyr Asn Ser Val Phe Gly Leu Pro Leu Pro Gly Phe
 165 170 175

Leu His Leu Thr Cys Pro His Tyr Trp Arg Tyr Gly Glu Glu Gly Glu
 180 185 190

Thr Glu Glu Gln Phe Val Ala Arg Leu Ala Arg Glu Leu Glu Glu Thr
 195 200 205

Ile Gln Lys Glu Gly Ala Asp Thr Ile Ala Gly Phe Phe Ala Glu Pro
 210 215 220

Val Met Gly Ala Gly Gly Val Ile Thr Pro Ala Lys Gly Tyr Phe Gln
 225 230 235 240

CX2-126USP1_ST25

Ala Ile Leu Pro Ile Leu Arg Lys Tyr Asp Ile Pro Val Ile Ser Asp
245 250 255

Glu Val Ile Cys Gly Phe Gly Arg Thr Gly Asn Thr Trp Gly Cys Val
260 265 270

Thr Tyr Asp Phe Thr Pro Asp Ala Ile Ile Ser Ser Lys Asn Leu Thr
275 280 285

Ala Gly Phe Phe Pro Val Gly Ala Val Ile Leu Gly Pro Glu Leu Ser
290 295 300

Lys Arg Leu Glu Thr Ala Ile Glu Ala Ile Gly Glu Phe Pro His Gly
305 310 315 320

Phe Thr Ala Gly Gly His Pro Val Gly Cys Ala Ile Ala Leu Lys Ala
325 330 335

Ile Asp Val Val Met Asn Glu Gly Leu Ala Glu Asn Val Arg Arg Leu
340 345 350

Ala Pro Arg Phe Glu Glu Arg Leu Lys His Ile Ala Glu Arg Pro Asn
355 360 365

Ile Gly Glu Tyr Arg Gly Ile Gly Phe Met Trp Ala Leu Glu Val Val
370 375 380

Lys Asp Lys Ala Ser Lys Ala Pro Phe Asp Gly Asn Leu Ser Val Ser
385 390 395 400

Glu Arg Ile Ala Asn Thr Cys Thr Asp Leu Gly Leu Ile Cys Arg Pro
405 410 415

Thr Gly Gln Ser Val Val Leu Cys Pro Pro Tyr Ile Leu Thr Glu Ala
420 425 430

Gln Met Asp Glu Met Phe Asp Lys Leu Glu Lys Ala Leu Asp Lys Val
435 440 445

Phe Ala Glu Val Ala
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<210> 53
<211> 1359
<212> DNA
<213> Artificial Sequence

<220>
<223> Engineered variant of v. fluvialis transaminase

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Page 70

CX2-126USP1_ST25

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 <211> 453
 <212> PRT
 <213> Artificial Sequence

<220>
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 <400> 54

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Tyr Gly Phe Thr Asp Met Pro Ser Leu His Gln Arg Gly Thr Met Val
20 25 30

Val Ala His Gly Glu Gly Pro Tyr Ile Val Asp Val His Gly Arg Arg
35 40 45

CX2-126USP1_ST25

Tyr Leu Asp Ala Asn Ser Gly Ala Leu Asn Met Val Ala Gly Phe Asp
 50 55 60
 His Lys Gly Leu Ile Asp Ala Ala Lys Ala Gln Tyr Glu Arg Phe Pro
 65 70 75 80
 Gly Tyr His Ala Phe Ser Gly His Met Ser Asp Gln Thr Val Met Leu
 85 90 95
 Ser Glu Lys Leu Val Glu Val Ser Pro Phe Asp Ser Gly Arg Val Phe
 100 105 110
 Tyr Thr Asn Ser Gly Ser Glu Ala Asn Asp Thr Met Val Lys Met Leu
 115 120 125
 Trp Phe Leu His Ala Ala Glu Gly Lys Pro Gln Lys Arg Lys Ile Leu
 130 135 140
 Thr Arg Trp Asn Ala Tyr His Gly Cys Thr Val Val Ser Ala Ser Met
 145 150 155 160
 Thr Gly Phe Pro Tyr Asn Ser Val Phe Gly Leu Pro Leu Pro Gly Phe
 165 170 175
 Leu His Leu Thr Cys Pro His Tyr Trp Arg Tyr Gly Glu Glu Gly Glu
 180 185 190
 Thr Glu Glu Gln Phe Val Ala Arg Leu Ala Arg Glu Leu Glu Glu Thr
 195 200 205
 Ile Gln Lys Glu Gly Ala Asp Thr Ile Ala Gly Phe Phe Ala Glu Pro
 210 215 220
 Val Met Gly Ala Gly Gly Val Ile Thr Pro Ala Lys Gly Tyr Phe Gln
 225 230 235 240
 Ala Ile Leu Thr Ile Leu Arg Lys Tyr Asp Ile Pro Val Ile Ser Asp
 245 250 255
 Glu Val Ile Cys Gly Phe Gly Arg Thr Gly Asn Thr Trp Gly Cys Val
 260 265 270
 Thr Tyr Asp Phe Thr Pro Asp Ala Ile Ile Ser Ser Lys Asn Leu Thr
 275 280 285
 Ala Gly Phe Phe Pro Val Gly Ala Val Ile Leu Gly Pro Glu Leu Ser
 290 295 300
 Lys Arg Leu Glu Thr Ala Ile Glu Ala Ile Gly Glu Phe Pro His Gly
 305 310 315 320

CX2-126USP1_ST25

Phe Thr Ala Gly Gly His Pro Val Gly Cys Ala Ile Ala Leu Lys Ala
325 330 335

Ile Asp Val Val Met Asn Glu Gly Leu Ala Glu Asn Val Arg Arg Leu
340 345 350

Ala Pro Arg Phe Glu Glu Arg Leu Lys His Ile Ala Glu Arg Pro Asn
355 360 365

Ile Gly Glu Tyr Arg Gly Ile Gly Phe Met Trp Ala Leu Glu Val Val
370 375 380

Lys Asp Lys Ala Ser Lys Ala Pro Phe Asp Gly Asn Leu Ser Val Ser
385 390 395 400

Glu Arg Ile Ala Asn Thr Cys Thr Asp Leu Gly Leu Ile Cys Arg Pro
405 410 415

Thr Gly Gln Ser Val Val Leu Cys Pro Pro Tyr Ile Leu Thr Glu Ala
420 425 430

Gln Met Asp Glu Met Phe Asp Lys Leu Glu Lys Ala Leu Asp Lys Val
435 440 445

Phe Ala Glu Val Ala
450

<210> 55
<211> 1359
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<213> Artificial Sequence

<220>
<223> Engineered variant of V. fluvialis transaminase

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CX2-126USP1_ST25

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<210> 56
 <211> 453
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> Engineered variant of V. fluvialis transaminase

<400> 56

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 1 5 10 15

Tyr Gly Phe Thr Asp Met Pro Ser Leu His Gln Arg Gly Thr Met Val
 20 25 30

Val Ala His Gly Glu Gly Pro Tyr Ile Val Asp Val His Gly Arg Arg
 35 40 45

Tyr Leu Asp Ala Asn Ser Gly Ala Leu Asn Met Val Ala Gly Phe Asp
 50 55 60

His Lys Gly Leu Ile Asp Ala Ala Lys Ala Gln Tyr Glu Arg Phe Pro
 65 70 75 80

Gly Tyr His Ala Phe Ser Gly His Met Ser Asp Gln Thr Val Met Leu
 85 90 95

Ser Glu Lys Leu Val Glu Val Ser Pro Phe Asp Ser Gly Arg Val Phe
 100 105 110

Tyr Thr Asn Ser Gly Ser Glu Ala Asn Asp Thr Met Val Lys Met Leu
 115 120 125

Trp Phe Leu His Ala Ala Glu Gly Lys Pro Gln Lys Arg Lys Ile Leu
 130 135 140

CX2-126USP1_ST25

Thr Arg Trp Asn Ala Tyr His Gly Cys Thr Val Val Ser Ala Ser Met
 145 150 155 160
 Thr Gly Phe Pro Tyr Asn Ser Val Phe Gly Leu Pro Leu Pro Gly Phe
 165 170 175
 Leu His Leu Thr Cys Pro His Tyr Trp Arg Tyr Gly Glu Glu Gly Glu
 180 185 190
 Thr Glu Glu Gln Phe Val Ala Arg Leu Ala Arg Glu Leu Glu Glu Thr
 195 200 205
 Ile Gln Lys Glu Gly Ala Asp Thr Ile Ala Gly Phe Phe Ala Glu Pro
 210 215 220
 Val Met Gly Ala Gly Gly Val Ile Thr Pro Ala Lys Gly Tyr Phe Gln
 225 230 235 240
 Ala Ile Leu Pro Ile Leu Arg Lys Tyr Asp Ile Pro Val Ile Ser Asp
 245 250 255
 Glu Val Ile Cys Gly Phe Gly Arg Thr Gly Asn Thr Trp Gly Cys Val
 260 265 270
 Thr Tyr Asp Phe Thr Pro Asp Ala Ile Ile Ser Ser Lys Asn Leu Thr
 275 280 285
 Ala Gly Phe Phe Pro Val Gly Ala Val Ile Leu Gly Pro Glu Leu Ser
 290 295 300
 Lys Arg Leu Glu Thr Ala Ile Glu Ala Ile Gly Glu Phe Pro His Gly
 305 310 315 320
 Phe Thr Ala Gly Gly His Pro Val Gly Cys Ala Ile Ala Leu Lys Ala
 325 330 335
 Ile Asp Val Val Met Asn Glu Gly Leu Ala Glu Asn Val Arg Arg Leu
 340 345 350
 Ala Pro Arg Phe Glu Glu Arg Leu Lys His Ile Ala Glu Arg Pro Asn
 355 360 365
 Ile Gly Glu Tyr Arg Gly Ile Gly Phe Met Trp Ala Leu Glu Ala Val
 370 375 380
 Lys Asp Lys Ala Ser Lys Ala Pro Phe Asp Gly Asn Leu Ser Val Ser
 385 390 395 400
 Glu Arg Ile Ala Asn Thr Cys Thr Asp Leu Gly Leu Ile Cys Arg Pro
 405 410 415

CX2-126USP1_ST25

Thr Gly Gln Ser Val Val Leu Ala Pro Pro Phe Ile Leu Thr Glu Ala
420 425 430

Gln Met Asp Glu Met Phe Asp Lys Leu Glu Lys Ala Leu Asp Lys Val
435 440 445

Phe Ala Glu Val Ala
450

<210> 57
<211> 1359
<212> DNA
<213> Artificial Sequence

<220>
<223> Engineered variant of V. fluvialis transaminase

<400> 57
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atcgtggatg tgcattggcg tcgttatctg gatgcgaaca gcggcgcttt gaacatggtg 180
gcgggctttg atcataaagg cctgattgat gcggcgaaaag cgagtatga acgttttccg 240
ggctatcatg cgttttcagg ccatatgagc gatcagaccg tgatgctgtc tgaaaaactg 300
gtggaagtga gcccgtttga tagcggccgt gtgttttata ccaacagcgg cagcgaagcg 360
aacgatacca tgggtgaaaat gctgtggttt ctgcatgcgg cggaaggcaa accgcaaaaa 420
cgtaaaattc tgaccgcgtg gaacgcgtat catggctgta ccgtagtgag cgcgagcatg 480
accggctttc cgtataacag cgtgtttggc ctgccgctgc cgggctttct gcatctgacc 540
tgcccgcatc attggcggtt tggcgaagaa ggcgaaaccg aagaacagtt tgtcgcgcgt 600
ctggcccgtg aactggaaga aaccattcag aagggaaggc cgataccat tgcgggcttt 660
tttgcggaac cggatgatgg tgcggcggt gttattccgc cggcgaaagg ctattttcag 720
gcgattctgc cgatcctgcg caaatatgat attccggtga tcagcgatga agtgatttgc 780
ggctttggcc gtaccggtta cacctggggc tgcgtgacct atgattttac cccggatgcg 840
attattagca gtaaaaacct aaccgcgggt ttttttccgg taggcgcggt gattctgggt 900
ccggaactga gcaaactctt ggaaaccgcg attgaagcga tcggcgaatt tccgcatggt 960
tttaccgcgg gcggccatcc ggtgggttgt gcgattgcgc tgaaagcgat tgatgtggtg 1020
atgaacgaag gcctggccga aaacgtgcgt cgtctggccc cgcgttttga agaactctg 1080
aaacatattg cggaactgcc gaacattggc gaatatcgtg gcattggctt tatgtgggcg 1140
ctggaagtcg tgaaagataa agcgagcaaa gccccgtttg atggcaacct gagcgtgagc 1200
gaacgtattg cgaacacctg caccgatctg ggcctgattt gccgtccgac aggccagagc 1260
gtggttctgt gcccgcggtt tattctgacc gaagcgcaga tggatgaaat gttcgataaa 1320
ctggaaaaag cgctggataa agtggttgcg gaagtggcg 1359

<210> 58
 <211> 453
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> Engineered variant of *V. fluvialis* transaminase

<400> 58

Met Asn Lys Pro Gln Ser Trp Glu Thr Arg Ala Glu Thr Tyr Ser Leu
 1 5 10 15

Tyr Gly Phe Thr Asp Met Pro Ser Leu His Gln Arg Gly Thr Val Val
 20 25 30

Val Ala His Gly Glu Gly Pro Tyr Ile Val Asp Val His Gly Arg Arg
 35 40 45

Tyr Leu Asp Ala Asn Ser Gly Ala Leu Asn Met Val Ala Gly Phe Asp
 50 55 60

His Lys Gly Leu Ile Asp Ala Ala Lys Ala Gln Tyr Glu Arg Phe Pro
 65 70 75 80

Gly Tyr His Ala Phe Ser Gly His Met Ser Asp Gln Thr Val Met Leu
 85 90 95

Ser Glu Lys Leu Val Glu Val Ser Pro Phe Asp Ser Gly Arg Val Phe
 100 105 110

Tyr Thr Asn Ser Gly Ser Glu Ala Asn Asp Thr Met Val Lys Met Leu
 115 120 125

Trp Phe Leu His Ala Ala Glu Gly Lys Pro Gln Lys Arg Lys Ile Leu
 130 135 140

Thr Arg Trp Asn Ala Tyr His Gly Cys Thr Val Val Ser Ala Ser Met
 145 150 155 160

Thr Gly Phe Pro Tyr Asn Ser Val Phe Gly Leu Pro Leu Pro Gly Phe
 165 170 175

Leu His Leu Thr Cys Pro His Tyr Trp Arg Tyr Gly Glu Glu Gly Glu
 180 185 190

Thr Glu Glu Gln Phe Val Ala Arg Leu Ala Arg Glu Leu Glu Glu Thr
 195 200 205

Ile Gln Lys Glu Gly Ala Asp Thr Ile Ala Gly Phe Phe Ala Glu Pro
 210 215 220

CX2-126USP1_ST25

Val Met Gly Ala Gly Gly Val Ile Pro Pro Ala Lys Gly Tyr Phe Gln
225 230 235 240

Ala Ile Leu Pro Ile Leu Arg Lys Tyr Asp Ile Pro Val Ile Ser Asp
245 250 255

Glu Val Ile Cys Gly Phe Gly Arg Thr Gly Asn Thr Trp Gly Cys Val
260 265 270

Thr Tyr Asp Phe Thr Pro Asp Ala Ile Ile Ser Ser Lys Asn Leu Thr
275 280 285

Ala Gly Phe Phe Pro Val Gly Ala Val Ile Leu Gly Pro Glu Leu Ser
290 295 300

Lys Arg Leu Glu Thr Ala Ile Glu Ala Ile Gly Glu Phe Pro His Gly
305 310 315 320

Phe Thr Ala Gly Gly His Pro Val Gly Cys Ala Ile Ala Leu Lys Ala
325 330 335

Ile Asp Val Val Met Asn Glu Gly Leu Ala Glu Asn Val Arg Arg Leu
340 345 350

Ala Pro Arg Phe Glu Glu Arg Leu Lys His Ile Ala Glu Arg Pro Asn
355 360 365

Ile Gly Glu Tyr Arg Gly Ile Gly Phe Met Trp Ala Leu Glu Val Val
370 375 380

Lys Asp Lys Ala Ser Lys Ala Pro Phe Asp Gly Asn Leu Ser Val Ser
385 390 395 400

Glu Arg Ile Ala Asn Thr Cys Thr Asp Leu Gly Leu Ile Cys Arg Pro
405 410 415

Thr Gly Gln Ser Val Val Leu Cys Pro Pro Phe Ile Leu Thr Glu Ala
420 425 430

Gln Met Asp Glu Met Phe Asp Lys Leu Glu Lys Ala Leu Asp Lys Val
435 440 445

Phe Ala Glu Val Ala
450

<210> 59
<211> 1359
<212> DNA
<213> Artificial sequence

<220>
<223> Engineered variant of v. fluvialis transaminase

CX2-126USP1_ST25

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<400> 59
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gatatgccga gcctgcatca gcgtggcacc atggtggtgg cccatggcga aggcccgat      120
atcgtggatg tgcattggccg tcgttatctg gatgcgaaca gcggcgcttt gaacatggtg      180
gcgggctttg atcataaagg cctgattgat gcggcgaaag cgcagtatga acgttttccg      240
ggctatcatg cgttttcagg ccatatgagc gatcagaccg tgatgctgtc tgaaaaactg      300
gtggaagtga gcccgtttga tagcggccgt gtgttttata ccaacagcgg cagcgaagcg      360
aacgatacca tgggtgaaaat gctgtggttt ctgcatgcgg cggaaggcaa accgcagaaa      420
cgtaaaattc tgaccgcga aaacgcgtat catggctgta ccgtagtgag cgcgagcatg      480
accggctttc cgtataacag cgtgtttggc ctgccgctgc cgggctttct gcatctgacc      540
tgcccgcatc attggcgta tggcgaagaa ggcgaaaccg aagaacagtt tgcgcgcgt      600
ctggcccgtg aactggaaga aaccattcag aagggaaggc cgataccat tgcgggcttt      660
tttgcggaac cgggtgatggg tgctggcggg gttattacac cggcgaaagg ctattttcag      720
gcgattctga ctatcctgcg caaatatgat attccggtga tcagcgatga agtgatttgc      780
ggctttggcc gtaccggtaa cacctggggc tgcgtgacct atgattttac cccggatgcg      840
attattagca gtaaaaacct aaccgcgggt ttttttccgg taggcgcggg gattctgggt      900
ccggaactga gcaaactgtc ggaaaccgcg attgaagcga tcggcgaatt tccgcatggt      960
tttaccgcgg gcggccatcc ggtgggttgt gcgattgcgc tgaaagcgat tgatgtggtg     1020
atgaacgaag gcctggccga aaacgtgcgt cgtctggccc cgcgttttga agaactgtct     1080
aaacatattg cggaacgtcc gaacattggc gaatatcgtg gcattggctt tatgtgggcg     1140
ctggaagtcg tgaaagataa agcgagcaaa gccccgtttg atggcaacct gagcgtgagc     1200
gaacgtattg cgaacacctg caccgatctg ggcctgattt gccgtccgac aggccagagc     1260
gtggttctgt gcccgcggtt tattctgacc gaagcgcaga tggatgaaat gttcgataaa     1320
ctggaaaaag cgctggataa agtgtttgcg gaagtggcg      1359

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<210> 60
<211> 453
<212> PRT
<213> Artificial Sequence

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<220>
<223> Engineered variant of V. fluvialis transaminase

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<400> 60

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Met Asn Lys Pro Gln Ser Trp Glu Thr Arg Ala Glu Thr Tyr Ser Leu
1           5           10           15

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Tyr Gly Phe Thr Asp Met Pro Ser Leu His Gln Arg Gly Thr Met Val
          20           25           30

```

```

Val Ala His Gly Glu Gly Pro Tyr Ile Val Asp Val His Gly Arg Arg
          35           40           45

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CX2-126USP1_ST25

Tyr Leu Asp Ala Asn Ser Gly Ala Leu Asn Met Val Ala Gly Phe Asp
 50 55 60
 His Lys Gly Leu Ile Asp Ala Ala Lys Ala Gln Tyr Glu Arg Phe Pro
 65 70 75 80
 Gly Tyr His Ala Phe Ser Gly His Met Ser Asp Gln Thr Val Met Leu
 85 90 95
 Ser Glu Lys Leu Val Glu Val Ser Pro Phe Asp Ser Gly Arg Val Phe
 100 105 110
 Tyr Thr Asn Ser Gly Ser Glu Ala Asn Asp Thr Met Val Lys Met Leu
 115 120 125
 Trp Phe Leu His Ala Ala Glu Gly Lys Pro Gln Lys Arg Lys Ile Leu
 130 135 140
 Thr Arg Lys Asn Ala Tyr His Gly Cys Thr Val Val Ser Ala Ser Met
 145 150 155 160
 Thr Gly Phe Pro Tyr Asn Ser Val Phe Gly Leu Pro Leu Pro Gly Phe
 165 170 175
 Leu His Leu Thr Cys Pro His Tyr Trp Arg Tyr Gly Glu Glu Gly Glu
 180 185 190
 Thr Glu Glu Gln Phe Val Ala Arg Leu Ala Arg Glu Leu Glu Glu Thr
 195 200 205
 Ile Gln Lys Glu Gly Ala Asp Thr Ile Ala Gly Phe Phe Ala Glu Pro
 210 215 220
 Val Met Gly Ala Gly Gly Val Ile Thr Pro Ala Lys Gly Tyr Phe Gln
 225 230 235 240
 Ala Ile Leu Thr Ile Leu Arg Lys Tyr Asp Ile Pro Val Ile Ser Asp
 245 250 255
 Glu Val Ile Cys Gly Phe Gly Arg Thr Gly Asn Thr Trp Gly Cys Val
 260 265 270
 Thr Tyr Asp Phe Thr Pro Asp Ala Ile Ile Ser Ser Lys Asn Leu Thr
 275 280 285
 Ala Gly Phe Phe Pro Val Gly Ala Val Ile Leu Gly Pro Glu Leu Ser
 290 295 300
 Lys Arg Leu Glu Thr Ala Ile Glu Ala Ile Gly Glu Phe Pro His Gly
 305 310 315 320

CX2-126USP1_ST25

Phe Thr Ala Gly Gly His Pro Val Gly Cys Ala Ile Ala Leu Lys Ala
325 330 335

Ile Asp Val Val Met Asn Glu Gly Leu Ala Glu Asn Val Arg Arg Leu
340 345 350

Ala Pro Arg Phe Glu Glu Arg Leu Lys His Ile Ala Glu Arg Pro Asn
355 360 365

Ile Gly Glu Tyr Arg Gly Ile Gly Phe Met Trp Ala Leu Glu Val Val
370 375 380

Lys Asp Lys Ala Ser Lys Ala Pro Phe Asp Gly Asn Leu Ser Val Ser
385 390 395 400

Glu Arg Ile Ala Asn Thr Cys Thr Asp Leu Gly Leu Ile Cys Arg Pro
405 410 415

Thr Gly Gln Ser Val Val Leu Cys Pro Pro Phe Ile Leu Thr Glu Ala
420 425 430

Gln Met Asp Glu Met Phe Asp Lys Leu Glu Lys Ala Leu Asp Lys Val
435 440 445

Phe Ala Glu Val Ala
450

<210> 61
<211> 1359
<212> DNA
<213> Artificial Sequence

<220>
<223> Engineered variant of V. fluvialis transaminase

<400> 61
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gatatgccga gcctgcatca gcgtggcacc atggtggtgg cccatggcga aggcccgat 120
atcgtggatg tgcattgccg tcgttatctg gatgcgaaca gcggcgcttt gaacatggtg 180
gcgggctttg atcataaagg cctgattgat gcggcgaaaag cgcagtatga acgttttccg 240
ggctatcatg cgttttcagg ccatatgagc gatcagaccg tgatgctgtc tgaaaaactg 300
gtggaagtga gcccgtttga tagcggccgt gtgttttata ccaacagcgg cagcgaagcg 360
aacgatacca tgggtgaaaat gctgtggttt ctgcatgcgg cggaaggcaa accgcagaaa 420
cgtaaaattc tgaccctgtg gaacgcgtat catggctgta ccgtagtgag cgcgagcatg 480
accggctttc cgtataacag cgtgtttggc ctgccgctgc cgggctttct gcatctgacc 540
tgcccgcatc attggcggtt tggcgaagaa ggcgaaaccg aagaacagtt tgtcgcgcgt 600
ctggcccgtg aactggaaga aaccattcag aagggaaggcg cgataccat tgcgggcttt 660

CX2-126USP1_ST25

tttgcggaac cggatgatggg tgctggcggg gttattccgc cggcgaaagg ctattttcag	720
gcgattctgc cgatcctgcg caaatatgat attccgggtga tcagcgatga agtgatttgc	780
ggcttttgcc gtaccggtaa cacctggggc tgcgtgacct atgattttac cccggatgcg	840
attattagca gtaaaaacct aaccgcgggt ttttttccgg taggcgcggg gattctgggt	900
ccggaactga gcaaactgtc ggaaaccgcg attgaagcga tcggcgaatt tccgcatggg	960
tttaccgcgg gcggccatcc ggtgggttgt gcgattgcgc tgaaagcgat tgatgtgggt	1020
atgaacgaag gcctggccga aaacgtgcgt cgtctggccc cgcgttttga agaactgtg	1080
aaacatatgt cggaactgcc gaacattggc gaatatcgtg gcattggctt tatgtggg	1140
ctggaagcgg tgaaagataa agcgagcaaa gccccgtttg atggcaacct gagcgtgagc	1200
gaacgtattg cgaacacctg caccgatctg ggcctgattt gccgtccgac aggccagagc	1260
gtggttctgg caccgccgtt tattctgacc gaagcgcaga tggatgaaat gttcgataaa	1320
ctggaaaaag cgctggataa agtgtttgcg gaagtggcg	1359

<210> 62
 <211> 453
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> Engineered variant of V. fluvialis transaminase
 <400> 62

Met	Asn	Lys	Pro	Gln	Ser	Trp	Glu	Thr	Arg	Ala	Glu	Thr	Tyr	Ser	Leu
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Tyr	Gly	Phe	Thr	Asp	Met	Pro	Ser	Leu	His	Gln	Arg	Gly	Thr	Met	Val
			20					25					30		

Val	Ala	His	Gly	Glu	Gly	Pro	Tyr	Ile	Val	Asp	Val	His	Gly	Arg	Arg
		35					40					45			

Tyr	Leu	Asp	Ala	Asn	Ser	Gly	Ala	Leu	Asn	Met	Val	Ala	Gly	Phe	Asp
	50					55					60				

His	Lys	Gly	Leu	Ile	Asp	Ala	Ala	Lys	Ala	Gln	Tyr	Glu	Arg	Phe	Pro
65					70					75					80

Gly	Tyr	His	Ala	Phe	Ser	Gly	His	Met	Ser	Asp	Gln	Thr	Val	Met	Leu
			85						90					95	

Ser	Glu	Lys	Leu	Val	Glu	Val	Ser	Pro	Phe	Asp	Ser	Gly	Arg	Val	Phe
			100					105					110		

Tyr	Thr	Asn	Ser	Gly	Ser	Glu	Ala	Asn	Asp	Thr	Met	Val	Lys	Met	Leu
		115					120					125			

CX2-126USP1_ST25

Trp Phe Leu His Ala Ala Glu Gly Lys Pro Gln Lys Arg Lys Ile Leu
130 135 140

Thr Arg Trp Asn Ala Tyr His Gly Cys Thr Val Val Ser Ala Ser Met
145 150 155 160

Thr Gly Phe Pro Tyr Asn Ser Val Phe Gly Leu Pro Leu Pro Gly Phe
165 170 175

Leu His Leu Thr Cys Pro His Tyr Trp Arg Tyr Gly Glu Glu Gly Glu
180 185 190

Thr Glu Glu Gln Phe Val Ala Arg Leu Ala Arg Glu Leu Glu Glu Thr
195 200 205

Ile Gln Lys Glu Gly Ala Asp Thr Ile Ala Gly Phe Phe Ala Glu Pro
210 215 220

Val Met Gly Ala Gly Gly Val Ile Pro Pro Ala Lys Gly Tyr Phe Gln
225 230 235 240

Ala Ile Leu Pro Ile Leu Arg Lys Tyr Asp Ile Pro Val Ile Ser Asp
245 250 255

Glu Val Ile Cys Gly Phe Gly Arg Thr Gly Asn Thr Trp Gly Cys Val
260 265 270

Thr Tyr Asp Phe Thr Pro Asp Ala Ile Ile Ser Ser Lys Asn Leu Thr
275 280 285

Ala Gly Phe Phe Pro Val Gly Ala Val Ile Leu Gly Pro Glu Leu Ser
290 295 300

Lys Arg Leu Glu Thr Ala Ile Glu Ala Ile Gly Glu Phe Pro His Gly
305 310 315 320

Phe Thr Ala Gly Gly His Pro Val Gly Cys Ala Ile Ala Leu Lys Ala
325 330 335

Ile Asp Val Val Met Asn Glu Gly Leu Ala Glu Asn Val Arg Arg Leu
340 345 350

Ala Pro Arg Phe Glu Glu Arg Leu Lys His Ile Ala Glu Arg Pro Asn
355 360 365

Ile Gly Glu Tyr Arg Gly Ile Gly Phe Met Trp Ala Leu Glu Ala Val
370 375 380

Lys Asp Lys Ala Ser Lys Ala Pro Phe Asp Gly Asn Leu Ser Val Ser
385 390 395 400

CX2-126USP1_ST25

Glu Arg Ile Ala Asn Thr Cys Thr Asp Leu Gly Leu Ile Cys Arg Pro
405 410 415

Thr Gly Gln Ser Val Val Leu Ala Pro Pro Phe Ile Leu Thr Glu Ala
420 425 430

Gln Met Asp Glu Met Phe Asp Lys Leu Glu Lys Ala Leu Asp Lys Val
435 440 445

Phe Ala Glu Val Ala
450

<210> 63
<211> 1359
<212> DNA
<213> Artificial Sequence

<220>
<223> Engineered variant of V. fluvialis transaminase

<400> 63
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catatgccga gcctgcatca gcgtggcacc atggtggtgg cccatggcga aggcccgat 120
atcgtggatg tgcattggcg tcgttatctg gatgcgaaca gcggcgcttt gaacatggtg 180
gcgggctttg atcataaagg cctgattgat gcggcgaaag cgcagtatga acgttttccg 240
ggctatcatg cgttttcagg ccatatgagc gatcagaccg tgatgctgtc tgaaaaactg 300
gtggaagtga gcccgtttga tagcggccgt gtgttttata ccaacagcgg cagcgaagcg 360
aacgatacca tgggtgaaaat gctgtggttt ctgcatgcgg cggaaggcaa accgcagaaa 420
cgtaaaattc tgaccggtg gaacgcgtat catggctgta ccgtagtgag cgcgagcatg 480
accggctttc cgtataacag cgtgtttggc ctgccgctgc cgggctttct gcattctgacc 540
tgcccgcatt attggcggtt tggcgaagaa ggcgaaaccg aagaacagtt tgcgcgcgt 600
ctggcccgtg aactggaaga aaccattcag aagggaaggc cggataccat tgcgggcttt 660
tttgcggaac cgggtgatgg tgctggcggg gttattccgc cggcgaaagg ctattttcag 720
gcgattctgc cgatcctgcg caaatatgat attccgggtg tcagcgatga agtgatttgc 780
ggctttggcc gtaccggtta cacctggggc tgcgtgacct atgattttac cccggatgcg 840
attattagca gtaaaaacct aaccgcgggt ttttttccgg taggcgcggg gattctgggt 900
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tttaccgcgg gcggccatcc ggtgggttgt gcgattgcgc tgaaagcgat tgatgtggtg 1020
atgaacgaag gcctggccga aaacgtgcgt cgtctggccc cgcgttttga agaactctg 1080
aaacatatgt cggaacgtcc gaacattggc gaatatcgtg gcattggctt tatgtgggcg 1140
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gaacgtattg cgaacacctg caccgatctg ggcctgattt gccgtccgac aggccagagc 1260
gtggttctgt gcccgcggtt tattctgacc gaagcgcaga tggatgaaat gttcgataaa 1320

ctggaaaaag cgctggataa agtgtttgcg gaagtggcg

1359

<210> 64
 <211> 453
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> Engineered variant of *V. fluvialis* transaminase

<400> 64

Met Asn Lys Pro Gln Ser Trp Glu Thr Arg Ala Glu Thr Tyr Ser Leu
 1 5 10 15

Tyr Gly Phe Thr His Met Pro Ser Leu His Gln Arg Gly Thr Met Val
 20 25 30

Val Ala His Gly Glu Gly Pro Tyr Ile Val Asp Val His Gly Arg Arg
 35 40 45

Tyr Leu Asp Ala Asn Ser Gly Ala Leu Asn Met Val Ala Gly Phe Asp
 50 55 60

His Lys Gly Leu Ile Asp Ala Ala Lys Ala Gln Tyr Glu Arg Phe Pro
 65 70 75 80

Gly Tyr His Ala Phe Ser Gly His Met Ser Asp Gln Thr Val Met Leu
 85 90 95

Ser Glu Lys Leu Val Glu Val Ser Pro Phe Asp Ser Gly Arg Val Phe
 100 105 110

Tyr Thr Asn Ser Gly Ser Glu Ala Asn Asp Thr Met Val Lys Met Leu
 115 120 125

Trp Phe Leu His Ala Ala Glu Gly Lys Pro Gln Lys Arg Lys Ile Leu
 130 135 140

Thr Arg Trp Asn Ala Tyr His Gly Cys Thr Val Val Ser Ala Ser Met
 145 150 155 160

Thr Gly Phe Pro Tyr Asn Ser Val Phe Gly Leu Pro Leu Pro Gly Phe
 165 170 175

Leu His Leu Thr Cys Pro His Tyr Trp Arg Tyr Gly Glu Glu Gly Glu
 180 185 190

Thr Glu Glu Gln Phe Val Ala Arg Leu Ala Arg Glu Leu Glu Glu Thr
 195 200 205

Ile Gln Lys Glu Gly Ala Asp Thr Ile Ala Gly Phe Phe Ala Glu Pro
 210 215 220

CX2-126USP1_ST25

Val Met Gly Ala Gly Gly Val Ile Pro Pro Ala Lys Gly Tyr Phe Gln
225 230 235 240

Ala Ile Leu Pro Ile Leu Arg Lys Tyr Asp Ile Pro Val Ile Ser Asp
245 250 255

Glu Val Ile Cys Gly Phe Gly Arg Thr Gly Asn Thr Trp Gly Cys Val
260 265 270

Thr Tyr Asp Phe Thr Pro Asp Ala Ile Ile Ser Ser Lys Asn Leu Thr
275 280 285

Ala Gly Phe Phe Pro Val Gly Ala Val Ile Leu Gly Pro Glu Leu Ser
290 295 300

Lys Arg Leu Glu Thr Ala Ile Glu Ala Ile Gly Glu Phe Pro His Gly
305 310 315 320

Phe Thr Ala Gly Gly His Pro Val Gly Cys Ala Ile Ala Leu Lys Ala
325 330 335

Ile Asp Val Val Met Asn Glu Gly Leu Ala Glu Asn Val Arg Arg Leu
340 345 350

Ala Pro Arg Phe Glu Glu Arg Leu Lys His Ile Ala Glu Arg Pro Asn
355 360 365

Ile Gly Glu Tyr Arg Gly Ile Gly Phe Met Trp Ala Leu Glu Ala Val
370 375 380

Lys Asp Lys Ala Ser Lys Ala Pro Phe Asp Gly Asn Leu Ser Val Ser
385 390 395 400

Glu Arg Ile Ala Asn Thr Cys Thr Asp Leu Gly Leu Ile Cys Arg Pro
405 410 415

Thr Gly Gln Ser Val Val Leu Cys Pro Pro Phe Ile Leu Thr Glu Ala
420 425 430

Gln Met Asp Glu Met Phe Asp Lys Leu Glu Lys Ala Leu Asp Lys Val
435 440 445

Phe Ala Glu Val Ala
450

<210> 65
<211> 1359
<212> DNA
<213> Artificial Sequence

<220>

CX2-126USP1_ST25

<223> Engineered variant of *V. fluvialis* transaminase

<400> 65
atgaacaaac cgagagctg ggaaacgcgt gcggaaacct atagcctgta tgggtttacc 60
gatatgccga gcctgcatca gcgtggcacc atggtggtgg cccatggcga aggcccgat 120
atcgtggatg tgcattggcg tcgttatctg gatgcgaaca gcggcgcttt gaacatggtg 180
gcgggctttg atcataaagg cctgattgat gcggcgaaaag cgagatga acgttttccg 240
ggctatcatg cgttttcagg ccataatgagc gatcagaccg tgatgctgtc tgaaaaactg 300
gtggaagtga gcccgtttga tagcggccgt gtgttttata ccaacagcgg cagcgaagcg 360
aacgatacca tgggtgaaaat gctgtggttt ctgcatgcgg cggaaggcaa accgcagaaa 420
cgtaaaattc tgaccctgtg gaacgcgtat catggctgta ccgtagtgag cgcgagcatg 480
accggctttc cgtataacag cgtgtttggc ctgccgctgc cgggctttct gcatctgacc 540
tgcccgcatc attggcggtt tggcgaagaa ggcgaaaccg aagaacagtt tgcgcgcgt 600
ctggcccgtg aactggaaga aaccattcag aagggaaggcg cggataccat tgcgggcttt 660
tttgcggaac cggatgatgg tgctggcggg gttattccgc cggcgaaagg ctattttcag 720
gcgattctgc cgatcctgcg caaatatgat attccggtga tcagcgatga agtgatttgc 780
ggctttggcc gtaccggtaa cacctggggc tgcgtgacct atgattttac cccgatgacg 840
attattagca gtaaaaacct aaccgcgggt ttttttccgg taggcgcggg gattctgggt 900
ccggaactga gcaaactctt ggaaaccgcg attgaagcga tcggcgaatt tccgcatggt 960
tttaccgcgg gcggccatcc ggtgggttgt gcgattgcgc tgaaagcgat tgatgtggtg 1020
atgaacgaag gcctggccga aaacgtgcgt cgtctggccc cgcgttttga agaactctg 1080
aaacatattg cggaactgcc gaacattggc gaatatcgtg gcattggctt tatgtgggcg 1140
ctggaagtcg tgaaagataa agcgagcaaa gccccgtttg atggcaacct gagcgtgagc 1200
gaacgtattg cgaacacctg caccgatctg ggcctgattt gccgtccgac aggccagagc 1260
gtggttctgt gcccgcgta tattctgacc gaagcgcaga tggatgaaat gttcgataaa 1320
ctggaaaaag cgctggataa agtgtttgcg gaagtggcg 1359

<210> 66

<211> 453

<212> PRT

<213> Artificial Sequence

<220>

<223> Engineered variant of *V. fluvialis* transaminase

<400> 66

Met Asn Lys Pro Gln Ser Trp Glu Thr Arg Ala Glu Thr Tyr Ser Leu
1 5 10 15

Tyr Gly Phe Thr Asp Met Pro Ser Leu His Gln Arg Gly Thr Met Val
20 25 30

CX2-126USP1_ST25

Val Ala His Gly Glu Gly Pro Tyr Ile Val Asp Val His Gly Arg Arg
35 40 45

Tyr Leu Asp Ala Asn Ser Gly Ala Leu Asn Met Val Ala Gly Phe Asp
50 55 60

His Lys Gly Leu Ile Asp Ala Ala Lys Ala Gln Tyr Glu Arg Phe Pro
65 70 75 80

Gly Tyr His Ala Phe Ser Gly His Met Ser Asp Gln Thr Val Met Leu
85 90 95

Ser Glu Lys Leu Val Glu Val Ser Pro Phe Asp Ser Gly Arg Val Phe
100 105 110

Tyr Thr Asn Ser Gly Ser Glu Ala Asn Asp Thr Met Val Lys Met Leu
115 120 125

Trp Phe Leu His Ala Ala Glu Gly Lys Pro Gln Lys Arg Lys Ile Leu
130 135 140

Thr Leu Trp Asn Ala Tyr His Gly Cys Thr Val Val Ser Ala Ser Met
145 150 155 160

Thr Gly Phe Pro Tyr Asn Ser Val Phe Gly Leu Pro Leu Pro Gly Phe
165 170 175

Leu His Leu Thr Cys Pro His Tyr Trp Arg Tyr Gly Glu Glu Gly Glu
180 185 190

Thr Glu Glu Gln Phe Val Ala Arg Leu Ala Arg Glu Leu Glu Glu Thr
195 200 205

Ile Gln Lys Glu Gly Ala Asp Thr Ile Ala Gly Phe Phe Ala Glu Pro
210 215 220

Val Met Gly Ala Gly Gly Val Ile Pro Pro Ala Lys Gly Tyr Phe Gln
225 230 235 240

Ala Ile Leu Pro Ile Leu Arg Lys Tyr Asp Ile Pro Val Ile Ser Asp
245 250 255

Glu Val Ile Cys Gly Phe Gly Arg Thr Gly Asn Thr Trp Gly Cys Val
260 265 270

Thr Tyr Asp Phe Thr Pro Asp Ala Ile Ile Ser Ser Lys Asn Leu Thr
275 280 285

Ala Gly Phe Phe Pro Val Gly Ala Val Ile Leu Gly Pro Glu Leu Ser
290 295 300

CX2-126USP1_ST25

Lys Arg Leu Glu Thr Ala Ile Glu Ala Ile Gly Glu Phe Pro His Gly
305 310 315 320

Phe Thr Ala Gly Gly His Pro Val Gly Cys Ala Ile Ala Leu Lys Ala
325 330 335

Ile Asp Val Val Met Asn Glu Gly Leu Ala Glu Asn Val Arg Arg Leu
340 345 350

Ala Pro Arg Phe Glu Glu Arg Leu Lys His Ile Ala Glu Arg Pro Asn
355 360 365

Ile Gly Glu Tyr Arg Gly Ile Gly Phe Met Trp Ala Leu Glu Val Val
370 375 380

Lys Asp Lys Ala Ser Lys Ala Pro Phe Asp Gly Asn Leu Ser Val Ser
385 390 395 400

Glu Arg Ile Ala Asn Thr Cys Thr Asp Leu Gly Leu Ile Cys Arg Pro
405 410 415

Thr Gly Gln Ser Val Val Leu Cys Pro Pro Tyr Ile Leu Thr Glu Ala
420 425 430

Gln Met Asp Glu Met Phe Asp Lys Leu Glu Lys Ala Leu Asp Lys Val
435 440 445

Phe Ala Glu Val Ala
450

<210> 67
<211> 1359
<212> DNA
<213> Artificial sequence

<220>
<223> Engineered variant of v. fluvialis transaminase

<400> 67
atgaacaaac cgcagagctg ggaaacgcgt gcggaaacct atagcctgta tgcgtttacc 60
gatatgccga gcctgcatca gcgtggcacc atggtggtgg cccatggcga agggccgtat 120
atcgtggatg tgcattggcg tcgttatctg gatgcgaaca gcggcgcttt gaacatggtg 180
gcgggctttg atcataaagg cctgattgat gcggcgaaag cgcagtatga acgttttccg 240
ggctatcatg cgttttcagg ccatatgagc gatcagaccg tgatgctgtc tgaaaaactg 300
gtggaagtga gcccgtttga tagcggccgt gtgttttata ccaacagcgg cagcgaagcg 360
aacgatacca tgggtgaaaat gctgtggttt ctgcatgcgg cggaaggcaa accgcagaaa 420
cgtaaaattc tgacccgctg gaacgcgtat catggctgta ccgtagtgag cgcgagcatg 480
accggctttc cgtataacag cgtgtttggc ctgccgctgc cgggctttct gcatctgacc 540
tgcccgcatt attggcggtta tggcgaagaa ggcgaaaccg aagaacagtt tgtcgcgcgt 600

CX2-126USP1_ST25

ctggcccgtg aactggaaga aaccattcag aaggaaggcg cggataccat tgcgggcttt 660
 tttgcggaac cggatgatggg tgctggcggg gttattacac cggcgaaagg ctattttcag 720
 gcgattctgc cgatcctgcg caaatatgat attccgggtga tcagcgatga agtgatttgc 780
 ggctttggcc gtaccggtaa cacctggggc tgcgtgacct atgattttac cccggatgcg 840
 attattagca gtaaaaacct aaccgcgggt ttttttccgg taggcgcggg gattctgggt 900
 ccggaactga gcaaactgtt ggaaaccgcg attgaagcga tcggcgaatt tccgcatggt 960
 tttaccgcgg gcggccatcc ggtgggttgt gcgattgcgc tgaaagcgat tgatgtggtg 1020
 atgaacgaag gcctggccga aaacgtgcgt cgtctggccc cgcgttttga agaactgtctg 1080
 aaacatattg cggaactgcc gaacattggc gaatatcgtg gcattggctt tatgtggggtg 1140
 ctggaagtcg tgaaagataa agcgagcaaa gccccgtttg atggcaacct gagcgtgagc 1200
 gaacgtattg cgaacacctg caccgatctg ggcttgattt gccgtccgac aggccagagc 1260
 gtggttctgg caccgccgtt tattctgacc gaagcgcaga tggatgaaat gttcgataaa 1320
 ctggaaaaag cgctggataa agtgtttgcg gaagtggcg 1359

<210> 68
 <211> 453
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> Engineered variant of V. fluvialis transaminase
 <400> 68

Met Asn Lys Pro Gln Ser Trp Glu Thr Arg Ala Glu Thr Tyr Ser Leu
 1 5 10 15

Tyr Ala Phe Thr Asp Met Pro Ser Leu His Gln Arg Gly Thr Met Val
 20 25 30

Val Ala His Gly Glu Gly Pro Tyr Ile Val Asp Val His Gly Arg Arg
 35 40 45

Tyr Leu Asp Ala Asn Ser Gly Ala Leu Asn Met Val Ala Gly Phe Asp
 50 55 60

His Lys Gly Leu Ile Asp Ala Ala Lys Ala Gln Tyr Glu Arg Phe Pro
 65 70 75 80

Gly Tyr His Ala Phe Ser Gly His Met Ser Asp Gln Thr Val Met Leu
 85 90 95

Ser Glu Lys Leu Val Glu Val Ser Pro Phe Asp Ser Gly Arg Val Phe
 100 105 110

Tyr Thr Asn Ser Gly Ser Glu Ala Asn Asp Thr Met Val Lys Met Leu
 115 120 125

CX2-126USP1_ST25

Trp Phe Leu His Ala Ala Glu Gly Lys Pro Gln Lys Arg Lys Ile Leu
 130 135 140
 Thr Arg Trp Asn Ala Tyr His Gly Cys Thr Val Val Ser Ala Ser Met
 145 150 155 160
 Thr Gly Phe Pro Tyr Asn Ser Val Phe Gly Leu Pro Leu Pro Gly Phe
 165 170 175
 Leu His Leu Thr Cys Pro His Tyr Trp Arg Tyr Gly Glu Glu Gly Glu
 180 185 190
 Thr Glu Glu Gln Phe Val Ala Arg Leu Ala Arg Glu Leu Glu Glu Thr
 195 200 205
 Ile Gln Lys Glu Gly Ala Asp Thr Ile Ala Gly Phe Phe Ala Glu Pro
 210 215 220
 Val Met Gly Ala Gly Gly Val Ile Thr Pro Ala Lys Gly Tyr Phe Gln
 225 230 235 240
 Ala Ile Leu Pro Ile Leu Arg Lys Tyr Asp Ile Pro Val Ile Ser Asp
 245 250 255
 Glu Val Ile Cys Gly Phe Gly Arg Thr Gly Asn Thr Trp Gly Cys Val
 260 265 270
 Thr Tyr Asp Phe Thr Pro Asp Ala Ile Ile Ser Ser Lys Asn Leu Thr
 275 280 285
 Ala Gly Phe Phe Pro Val Gly Ala Val Ile Leu Gly Pro Glu Leu Ser
 290 295 300
 Lys Arg Leu Glu Thr Ala Ile Glu Ala Ile Gly Glu Phe Pro His Gly
 305 310 315 320
 Phe Thr Ala Gly Gly His Pro Val Gly Cys Ala Ile Ala Leu Lys Ala
 325 330 335
 Ile Asp Val Val Met Asn Glu Gly Leu Ala Glu Asn Val Arg Arg Leu
 340 345 350
 Ala Pro Arg Phe Glu Glu Arg Leu Lys His Ile Ala Glu Arg Pro Asn
 355 360 365
 Ile Gly Glu Tyr Arg Gly Ile Gly Phe Met Trp Ala Leu Glu Val Val
 370 375 380
 Lys Asp Lys Ala Ser Lys Ala Pro Phe Asp Gly Asn Leu Ser Val Ser
 385 390 395 400

CX2-126USP1_ST25

Glu Arg Ile Ala Asn Thr Cys Thr Asp Leu Gly Leu Ile Cys Arg Pro
405 410 415

Thr Gly Gln Ser Val Val Leu Ala Pro Pro Phe Ile Leu Thr Glu Ala
420 425 430

Gln Met Asp Glu Met Phe Asp Lys Leu Glu Lys Ala Leu Asp Lys Val
435 440 445

Phe Ala Glu Val Ala
450

<210> 69
<211> 1359
<212> DNA
<213> Artificial Sequence

<220>
<223> Engineered variant of V. fluvialis transaminase

<400> 69
atgaacaaac cgcagagctg ggaaacgcgt gcggaaacct atagcctgta tgggtttacc 60
catatgccga gcctgcatca gcgtggcacc atggtggtgg cccatggcga aggcccgat 120
atcgtggatg tgcattggcg tcgttatctg gatgcgaaca gcggcgcttt gaacatggtg 180
gcgggctttg atcataaagg cctgattgat gcggcgaaag cgcagtatga acgttttccg 240
ggctatcatg cgttttcagg ccatatgagc gatcagaccg tgatgctgtc tgaaaaactg 300
gtggaagtga gcccgtttga tagcggccgt gtgttttata ccaacagcgg cagcgaagcg 360
aacgatacca tgggtgaaaat gctgtggttt ctgcatgcgg cggaaggcaa accgcagaaa 420
cgtaaaattc tgaccgcgtg gaacgcgtat catggctgta ccgtagtgag cgcgagcatg 480
accggctttc cgtataacag cgtgtttggc ctgccgctgc cgggctttct gcatctgacc 540
tgccgcgatt attggcggtt tggcgaagaa ggcgaaaccg aagaacagtt tgcgcgcgt 600
ctggcccgtg aactggaaga aaccattcag aagggaaggcg cggataccat tgcgggcttt 660
tttgcggaac cggatgatgg tgctggcggg gttattccgc cggcgaaagg ctattttcag 720
gcgattctgc cgatcctgcg caaatatgat attccggtga tcagcgatga agtgatttgc 780
ggctttggcc gtaccggtaa cacctggggc tgcgtgacct atgattttac cccggatgcg 840
attattagca gtaaaaacct aaccgcgggt ttttttccgg taggcgcggg gattctgggt 900
ccggaactga gcaaactctt ggaaaccgcg attgaagcga tcggcgaatt tccgatggt 960
tttaccgcgg gcggccatcc ggtgggttgt gcgattgcgc tgaaagcgat tgatgtggtg 1020
atgaacgaag gcctggccga aaacgtgcgt cgtctggccc cgcgttttga agaactctg 1080
aaacatattg cgaacgtcc gaacattggc gaatatcgtg gcattggctt tatgtgggcg 1140
ctggaagtcg tgaaagataa agcgagcaaa gccccgtttg atggcaacct gagcgtgagc 1200
gaacgtattg cgaacacctg caccgatctg ggcctgattt gccgtccgac aggccagagc 1260

CX2-126USP1_ST25

gtggttctgt gcccgccgta tattctgacc gaagcgcaga tggatgaaat gttcgataaa 1320
ctggaaaaag cgctggataa agtgtttgcg gaagtggcg 1359

<210> 70
<211> 453
<212> PRT
<213> Artificial Sequence

<220>
<223> Engineered variant of V. fluvialis transaminase

<400> 70

Met Asn Lys Pro Gln Ser Trp Glu Thr Arg Ala Glu Thr Tyr Ser Leu
1 5 10 15

Tyr Gly Phe Thr His Met Pro Ser Leu His Gln Arg Gly Thr Met Val
20 25 30

Val Ala His Gly Glu Gly Pro Tyr Ile Val Asp Val His Gly Arg Arg
35 40 45

Tyr Leu Asp Ala Asn Ser Gly Ala Leu Asn Met Val Ala Gly Phe Asp
50 55 60

His Lys Gly Leu Ile Asp Ala Ala Lys Ala Gln Tyr Glu Arg Phe Pro
65 70 75 80

Gly Tyr His Ala Phe Ser Gly His Met Ser Asp Gln Thr Val Met Leu
85 90 95

Ser Glu Lys Leu Val Glu Val Ser Pro Phe Asp Ser Gly Arg Val Phe
100 105 110

Tyr Thr Asn Ser Gly Ser Glu Ala Asn Asp Thr Met Val Lys Met Leu
115 120 125

Trp Phe Leu His Ala Ala Glu Gly Lys Pro Gln Lys Arg Lys Ile Leu
130 135 140

Thr Arg Trp Asn Ala Tyr His Gly Cys Thr Val Val Ser Ala Ser Met
145 150 155 160

Thr Gly Phe Pro Tyr Asn Ser Val Phe Gly Leu Pro Leu Pro Gly Phe
165 170 175

Leu His Leu Thr Cys Pro His Tyr Trp Arg Tyr Gly Glu Glu Gly Glu
180 185 190

Thr Glu Glu Gln Phe Val Ala Arg Leu Ala Arg Glu Leu Glu Glu Thr
195 200 205

CX2-126USP1_ST25

Ile Gln Lys Glu Gly Ala Asp Thr Ile Ala Gly Phe Phe Ala Glu Pro
210 215 220

Val Met Gly Ala Gly Gly Val Ile Pro Pro Ala Lys Gly Tyr Phe Gln
225 230 235 240

Ala Ile Leu Pro Ile Leu Arg Lys Tyr Asp Ile Pro Val Ile Ser Asp
245 250 255

Glu Val Ile Cys Gly Phe Gly Arg Thr Gly Asn Thr Trp Gly Cys Val
260 265 270

Thr Tyr Asp Phe Thr Pro Asp Ala Ile Ile Ser Ser Lys Asn Leu Thr
275 280 285

Ala Gly Phe Phe Pro Val Gly Ala Val Ile Leu Gly Pro Glu Leu Ser
290 295 300

Lys Arg Leu Glu Thr Ala Ile Glu Ala Ile Gly Glu Phe Pro His Gly
305 310 315 320

Phe Thr Ala Gly Gly His Pro Val Gly Cys Ala Ile Ala Leu Lys Ala
325 330 335

Ile Asp Val Val Met Asn Glu Gly Leu Ala Glu Asn Val Arg Arg Leu
340 345 350

Ala Pro Arg Phe Glu Glu Arg Leu Lys His Ile Ala Glu Arg Pro Asn
355 360 365

Ile Gly Glu Tyr Arg Gly Ile Gly Phe Met Trp Ala Leu Glu Val Val
370 375 380

Lys Asp Lys Ala Ser Lys Ala Pro Phe Asp Gly Asn Leu Ser Val Ser
385 390 395 400

Glu Arg Ile Ala Asn Thr Cys Thr Asp Leu Gly Leu Ile Cys Arg Pro
405 410 415

Thr Gly Gln Ser Val Val Leu Cys Pro Pro Tyr Ile Leu Thr Glu Ala
420 425 430

Gln Met Asp Glu Met Phe Asp Lys Leu Glu Lys Ala Leu Asp Lys Val
435 440 445

Phe Ala Glu Val Ala
450

<210> 71
<211> 1359
<212> DNA
<213> Artificial Sequence

CX2-126USP1_ST25

<220>

<223> Engineered variant of V. fluvialis transaminase

<400> 71

atgaacaaac cgcagagctg ggaaacgcgt gcggaaacct atagcctgta tggttggacc	60
gatatgccga gcctgcatca gcgtggcacc gtggtggtgg cccatggcga agggccgtat	120
atcgtggatg tgcattggccg tcgttatctg gatgcgaaca gcggcgcttt gaacatgggt	180
gcgggctttg atcataaagg cctgattgat gcggcgaaag cgcagtatga acgttttccg	240
ggctatcatg cgttttcagg ccatatgagc gatcagaccg tgatgctgtc tgaaaaactg	300
gtggaagtga gcccgtttga tagcggccgt gtgttttata ccaacagcgg cagcgaagcg	360
aacgatacca tgggtgaaaat gctgtggttt ctgcatgcgg cggaaggcaa accgcagaaa	420
cgtaaaattc tgaccggtt gaacgcgtat catggctgta ccgtagtgag cgcgagcatg	480
accggctttc cgtataacag cgtgtttggc ctgccgctgc cgggctttct gcatctgacc	540
tgcccgcatt attggcggtt tggcgaagaa ggcgaaaccg aagaacagtt tgtcgcgcgt	600
ctggcccgtg aactggaaga aaccattcag aagggaaggcg cggataccat tgcgggcttt	660
tttgcggaac cgggtgatggg tgctggcggg gttattccgc cggcgaaagg ctattttcag	720
gcgattctgc cgatcctgcg caaatatgat attccgggtga tcagcgatga agtgatttgc	780
ggctttggcc gtaccggtaa cacctggggc tgctgacat atgattttac cccggatgcg	840
attattagca gtaaaaacct aaccgcgggt ttttttccgg taggcgcggg gattctgggt	900
ccggaactga gcaaacgtct ggaaaccgcg attgaagcga tcggcgaatt tccgcatggt	960
tttaccgcgg gcggccatcc ggtgggttgt gcgattgcgc tgaaagcgat tgatgtggtg	1020
atgaacgaag gcctggccga aaacgtgcgt cgtctggccc cgcgttttga aaaacgtctg	1080
aaacatattg cggaacgtcc gaacattggc gaatatcgtg gcattggctt tatgtgggcg	1140
ctggaagcgg tgaaagataa agcgagcaaa gccccgtttg atggcaacct gagcgtgagc	1200
gaacgtattg cgaacacctg caccgatctg ggctgattt gccgtccgac aggccagagc	1260
gtggttctgt gcccgcggtt tattctgacc gaagcgcaga tggatgaaat gttcgataaa	1320
ctggaaaaag cgctggataa agtggtttgcg gaagtggcg	1359

<210> 72

<211> 453

<212> PRT

<213> Artificial Sequence

<220>

<223> Engineered variant of V. fluvialis transaminase

<400> 72

Met	Asn	Lys	Pro	Gln	Ser	Trp	Glu	Thr	Arg	Ala	Glu	Thr	Tyr	Ser	Leu
1				5					10					15	

Tyr	Gly	Trp	Thr	Asp	Met	Pro	Ser	Leu	His	Gln	Arg	Gly	Thr	Val	Val
			20					25					30		

CX2-126USP1_ST25

Val Ala His Gly Glu Gly Pro Tyr Ile Val Asp Val His Gly Arg Arg
 35 40 45
 Tyr Leu Asp Ala Asn Ser Gly Ala Leu Asn Met Val Ala Gly Phe Asp
 50 55 60
 His Lys Gly Leu Ile Asp Ala Ala Lys Ala Gln Tyr Glu Arg Phe Pro
 65 70 75 80
 Gly Tyr His Ala Phe Ser Gly His Met Ser Asp Gln Thr Val Met Leu
 85 90 95
 Ser Glu Lys Leu Val Glu Val Ser Pro Phe Asp Ser Gly Arg Val Phe
 100 105 110
 Tyr Thr Asn Ser Gly Ser Glu Ala Asn Asp Thr Met Val Lys Met Leu
 115 120 125
 Trp Phe Leu His Ala Ala Glu Gly Lys Pro Gln Lys Arg Lys Ile Leu
 130 135 140
 Thr Arg Trp Asn Ala Tyr His Gly Cys Thr Val Val Ser Ala Ser Met
 145 150 155 160
 Thr Gly Phe Pro Tyr Asn Ser Val Phe Gly Leu Pro Leu Pro Gly Phe
 165 170 175
 Leu His Leu Thr Cys Pro His Tyr Trp Arg Tyr Gly Glu Glu Gly Glu
 180 185 190
 Thr Glu Glu Gln Phe Val Ala Arg Leu Ala Arg Glu Leu Glu Glu Thr
 195 200 205
 Ile Gln Lys Glu Gly Ala Asp Thr Ile Ala Gly Phe Phe Ala Glu Pro
 210 215 220
 Val Met Gly Ala Gly Gly Val Ile Pro Pro Ala Lys Gly Tyr Phe Gln
 225 230 235 240
 Ala Ile Leu Pro Ile Leu Arg Lys Tyr Asp Ile Pro Val Ile Ser Asp
 245 250 255
 Glu Val Ile Cys Gly Phe Gly Arg Thr Gly Asn Thr Trp Gly Cys Val
 260 265 270
 Thr Tyr Asp Phe Thr Pro Asp Ala Ile Ile Ser Ser Lys Asn Leu Thr
 275 280 285
 Ala Gly Phe Phe Pro Val Gly Ala Val Ile Leu Gly Pro Glu Leu Ser
 290 295 300

CX2-126USP1_ST25

Lys Arg Leu Glu Thr Ala Ile Glu Ala Ile Gly Glu Phe Pro His Gly
305 310 315 320

Phe Thr Ala Gly Gly His Pro Val Gly Cys Ala Ile Ala Leu Lys Ala
325 330 335

Ile Asp Val Val Met Asn Glu Gly Leu Ala Glu Asn Val Arg Arg Leu
340 345 350

Ala Pro Arg Phe Glu Lys Arg Leu Lys His Ile Ala Glu Arg Pro Asn
355 360 365

Ile Gly Glu Tyr Arg Gly Ile Gly Phe Met Trp Ala Leu Glu Ala Val
370 375 380

Lys Asp Lys Ala Ser Lys Ala Pro Phe Asp Gly Asn Leu Ser Val Ser
385 390 395 400

Glu Arg Ile Ala Asn Thr Cys Thr Asp Leu Gly Leu Ile Cys Arg Pro
405 410 415

Thr Gly Gln Ser Val Val Leu Cys Pro Pro Phe Ile Leu Thr Glu Ala
420 425 430

Gln Met Asp Glu Met Phe Asp Lys Leu Glu Lys Ala Leu Asp Lys Val
435 440 445

Phe Ala Glu Val Ala
450

<210> 73
<211> 1359
<212> DNA
<213> Artificial Sequence

<220>
<223> Engineered variant of V. fluvialis transaminase

<400> 73
atgaacaaac cgcagagctg ggaaacgcgt gcggaaacct atagcctgta tggttttacc 60
gatatgccga gcctgcatca gcgtggcacc gtggtggtgg cccatggcga aggcccgat 120
atcgtggatg tgcattggccg tcgttatctg gatgcgaaca gcggctgttt gaacatggtg 180
gcgggctttg atcataaagg cctgattgat gcggcgaaag cgcagtatga acgttttccg 240
ggctatcatg cgttttcagg ccatatgagc gatcagaccg tgatgctgtc tgaaaaactg 300
gtggaagtga gcccgtttga tagcggccgt gtgttttata ccaacagcgg cagcgaagcg 360
aacgatacca tgggtgaaaat gctgtggttt ctgcatgcgg cggaaggcaa accgcagaaa 420
cgtaaaattc tgaccggtt gaacgcgtat catggctgta ccgtagtgag cgcgagcatg 480
accggctttc cgtataacag cgtgtttggc ctgccgctgc cgggctttct gcatctgacc 540

CX2-126USP1_ST25

tgcccgcat	attggcg	tta	tg	gcgaaga	ggcgaaaccg	aagaacagtt	tg	tcgcgcgt	600
ctggcccgtg	aactggaaga	aaccattcag	aaggaaggcg	cggataccat	tg	cg	gggcttt	660	
tttgcggaac	cggtgatggg	tgctggcggt	gttattccgc	cggcgaaagg	ct	at	ttttcag	720	
gcgattctgc	cgatcctgcg	caaatatgat	attccgggtga	tcagcgatga	agt	gatt	ttgc	780	
ggctttggcc	gtaccggtaa	cacctggggc	tg	cg	tgac	ct	atgattttac	840	
attattagca	gtaaaaac	ct	aaccgcgggt	ttttttccgg	taggcgcggt	gatt	ctgggt	900	
ccggaactga	gcaaacgtct	ggaaaccgcg	attgaagcga	tcggcgaa	tt	tccg	catggt	960	
tttaccgcgg	gcggccatcc	ggtgggttgt	gc	gatt	gcgc	tg	aaaagcgat	1020	
atgaacgaag	gcctggccga	aaacgtgcgt	cgtctggccc	cg	cg	ttttga	agaacgtctg	1080	
aaacatattg	cggaacgtcc	gaacattggc	gaatatcgtg	gc	attgg	ctt	tatgtgggcg	1140	
ctggaagcgg	tgaaagataa	agcgagcaaa	gccccgtttg	at	gg	caac	ct	1200	
gaacgtattg	cgaacac	ctg	caccgat	ctg	gg	cctg	attt	1260	
gtggttctgt	gcccgcggt	tattctgacc	gaagcgcaga	tg	gat	gaa	at	1320	
ctggaaaaag	cgctggataa	agtgtttgcg	gaagtggcg					1359	

<210> 74
 <211> 453
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> Engineered variant of V. fluvialis transaminase

<400> 74

Met	Asn	Lys	Pro	Gln	Ser	Trp	Glu	Thr	Arg	Ala	Glu	Thr	Tyr	Ser	Leu
1				5					10					15	
Tyr	Gly	Phe	Thr	Asp	Met	Pro	Ser	Leu	His	Gln	Arg	Gly	Thr	Val	Val
			20					25					30		
Val	Ala	His	Gly	Glu	Gly	Pro	Tyr	Ile	Val	Asp	Val	His	Gly	Arg	Arg
		35					40					45			
Tyr	Leu	Asp	Ala	Asn	Ser	Gly	Cys	Leu	Asn	Met	Val	Ala	Gly	Phe	Asp
	50					55					60				
His	Lys	Gly	Leu	Ile	Asp	Ala	Ala	Lys	Ala	Gln	Tyr	Glu	Arg	Phe	Pro
65					70					75					80
Gly	Tyr	His	Ala	Phe	Ser	Gly	His	Met	Ser	Asp	Gln	Thr	Val	Met	Leu
				85					90					95	
Ser	Glu	Lys	Leu	Val	Glu	Val	Ser	Pro	Phe	Asp	Ser	Gly	Arg	Val	Phe
			100					105					110		

Tyr Thr Asn Ser Gly Ser Glu Ala Asn Asp Thr Met Val Lys Met Leu
 115 120 125
 Trp Phe Leu His Ala Ala Glu Gly Lys Pro Gln Lys Arg Lys Ile Leu
 130 135 140
 Thr Arg Trp Asn Ala Tyr His Gly Cys Thr Val Val Ser Ala Ser Met
 145 150 155 160
 Thr Gly Phe Pro Tyr Asn Ser Val Phe Gly Leu Pro Leu Pro Gly Phe
 165 170 175
 Leu His Leu Thr Cys Pro His Tyr Trp Arg Tyr Gly Glu Glu Gly Glu
 180 185 190
 Thr Glu Glu Gln Phe Val Ala Arg Leu Ala Arg Glu Leu Glu Glu Thr
 195 200 205
 Ile Gln Lys Glu Gly Ala Asp Thr Ile Ala Gly Phe Phe Ala Glu Pro
 210 215 220
 Val Met Gly Ala Gly Gly Val Ile Pro Pro Ala Lys Gly Tyr Phe Gln
 225 230 235 240
 Ala Ile Leu Pro Ile Leu Arg Lys Tyr Asp Ile Pro Val Ile Ser Asp
 245 250 255
 Glu Val Ile Cys Gly Phe Gly Arg Thr Gly Asn Thr Trp Gly Cys Val
 260 265 270
 Thr Tyr Asp Phe Thr Pro Asp Ala Ile Ile Ser Ser Lys Asn Leu Thr
 275 280 285
 Ala Gly Phe Phe Pro Val Gly Ala Val Ile Leu Gly Pro Glu Leu Ser
 290 295 300
 Lys Arg Leu Glu Thr Ala Ile Glu Ala Ile Gly Glu Phe Pro His Gly
 305 310 315 320
 Phe Thr Ala Gly Gly His Pro Val Gly Cys Ala Ile Ala Leu Lys Ala
 325 330 335
 Ile Asp Val Val Met Asn Glu Gly Leu Ala Glu Asn Val Arg Arg Leu
 340 345 350
 Ala Pro Arg Phe Glu Glu Arg Leu Lys His Ile Ala Glu Arg Pro Asn
 355 360 365
 Ile Gly Glu Tyr Arg Gly Ile Gly Phe Met Trp Ala Leu Glu Ala Val
 370 375 380

CX2-126USP1_ST25

Lys Asp Lys Ala Ser Lys Ala Pro Phe Asp Gly Asn Leu Ser Val Ser
385 390 395 400

Glu Arg Ile Ala Asn Thr Cys Thr Asp Leu Gly Leu Ile Cys Arg Pro
405 410 415

Thr Gly Gln Ser Val Val Leu Cys Pro Pro Phe Ile Leu Thr Glu Ala
420 425 430

Gln Met Asp Glu Met Phe Asp Lys Leu Glu Lys Ala Leu Asp Lys Val
435 440 445

Phe Ala Glu Val Ala
450

<210> 75
<211> 1359
<212> DNA
<213> Artificial Sequence

<220>
<223> Engineered variant of V. fluvialis transaminase

<400> 75
atgaacaaac cgcagagctg ggaaacgcgt gcggaaacct atagcctgta tggttttacc 60
gatatgccga gcctgcatca gcgtggcacc gtggtggtgg cccatggcga aggcccgtat 120
atcgtggatg tgcattggcg tcgttatctg gatgcgaaca gcggcgcttt taacatgggtg 180
gcgggctttg atcataaagg cctgattgat gcggcgaaaag cgcagtatga acgttttccg 240
ggctatcatg cgttttcagg ccatatgagc gatcagaccg tgatgctgtc tgaaaaactg 300
gtggaagtga gcccgtttga tagcggccgt gtgttttata ccaacagcgg cagcgaagcg 360
aacgatacca tgggtgaaaat gctgtggttt ctgcatgcgg cggaaggcaa accgcagaaa 420
cgtaaaattc tgaccggtt gaacgcgtat catggctgta ccgtagtgag cgcgagcatg 480
accggctttc cgtataacag cgtgtttggc ctgccgctgc cgggctttct gcatctgacc 540
tgcccgcatc attggcggtt tggcgaagaa ggcgaaaccg aagaacagtt tgtcgcgcgt 600
ctggcccgtg aactggaaga aaccattcag aaggaaaggcg cggataccat tgcgggcttt 660
tttgcggaac cggatgatgg tgctggcggg gttattccgc cggcgaaagg ctattttcag 720
gcgattctgc cgatcctgcg caaatatgat attccgggtg tcagcgatga agtgatttgc 780
ggctttggcc gtaccggtaa cacctggggc tgcgtgacct atgattttac cccggatgcg 840
attattagca gtaaaaacct aaccgcgggt ttttttccgg taggcgcggg gattctgggt 900
ccggaactga gcaaactct ggaaaccgcg attgaagcga tcggcgaatt tccgcatggt 960
tttaccgcgg gcggccatcc ggtgggttgt gcgattgcgc tgaaagcgat tgatgtggtg 1020
atgaacgaag gcctggccga aaacgtgcgt cgtctggccc cgcgttttga agaactctg 1080
aaacatattg cggaactcc gaacattggc gaatatcgtg gcattggctt tatgtgggcg 1140
ctggaagcgg tgaaagataa agcgagcaaa gccccgtttg atggcaacct gagcgtgagc 1200

CX2-126USP1_ST25

gaacgtattg cgaacacctg caccgatctg ggcctgattt gccgtccgac aggccagagc 1260
gtggttctgt gcccgccgtt tattctgacc gaagcgcaga tggatgaaat gttcgataaa 1320
ctggaaaaag cgctggataa agtgtttgcg gaagtggcg 1359

<210> 76
<211> 453
<212> PRT
<213> Artificial sequence

<220>
<223> Engineered variant of v. fluvialis transaminase

<400> 76

Met Asn Lys Pro Gln Ser Trp Glu Thr Arg Ala Glu Thr Tyr Ser Leu
1 5 10 15

Tyr Gly Phe Thr Asp Met Pro Ser Leu His Gln Arg Gly Thr Val Val
20 25 30

Val Ala His Gly Glu Gly Pro Tyr Ile Val Asp Val His Gly Arg Arg
35 40 45

Tyr Leu Asp Ala Asn Ser Gly Ala Phe Asn Met Val Ala Gly Phe Asp
50 55 60

His Lys Gly Leu Ile Asp Ala Ala Lys Ala Gln Tyr Glu Arg Phe Pro
65 70 75 80

Gly Tyr His Ala Phe Ser Gly His Met Ser Asp Gln Thr Val Met Leu
85 90 95

Ser Glu Lys Leu Val Glu Val Ser Pro Phe Asp Ser Gly Arg Val Phe
100 105 110

Tyr Thr Asn Ser Gly Ser Glu Ala Asn Asp Thr Met Val Lys Met Leu
115 120 125

Trp Phe Leu His Ala Ala Glu Gly Lys Pro Gln Lys Arg Lys Ile Leu
130 135 140

Thr Arg Trp Asn Ala Tyr His Gly Cys Thr Val Val Ser Ala Ser Met
145 150 155 160

Thr Gly Phe Pro Tyr Asn Ser Val Phe Gly Leu Pro Leu Pro Gly Phe
165 170 175

Leu His Leu Thr Cys Pro His Tyr Trp Arg Tyr Gly Glu Glu Gly Glu
180 185 190

Thr Glu Glu Gln Phe Val Ala Arg Leu Ala Arg Glu Leu Glu Glu Thr
195 200 205

CX2-126USP1_ST25

Ile Gln Lys Glu Gly Ala Asp Thr Ile Ala Gly Phe Phe Ala Glu Pro
210 215 220

Val Met Gly Ala Gly Gly Val Ile Pro Pro Ala Lys Gly Tyr Phe Gln
225 230 235 240

Ala Ile Leu Pro Ile Leu Arg Lys Tyr Asp Ile Pro Val Ile Ser Asp
245 250 255

Glu Val Ile Cys Gly Phe Gly Arg Thr Gly Asn Thr Trp Gly Cys Val
260 265 270

Thr Tyr Asp Phe Thr Pro Asp Ala Ile Ile Ser Ser Lys Asn Leu Thr
275 280 285

Ala Gly Phe Phe Pro Val Gly Ala Val Ile Leu Gly Pro Glu Leu Ser
290 295 300

Lys Arg Leu Glu Thr Ala Ile Glu Ala Ile Gly Glu Phe Pro His Gly
305 310 315 320

Phe Thr Ala Gly Gly His Pro Val Gly Cys Ala Ile Ala Leu Lys Ala
325 330 335

Ile Asp Val Val Met Asn Glu Gly Leu Ala Glu Asn Val Arg Arg Leu
340 345 350

Ala Pro Arg Phe Glu Glu Arg Leu Lys His Ile Ala Glu Arg Pro Asn
355 360 365

Ile Gly Glu Tyr Arg Gly Ile Gly Phe Met Trp Ala Leu Glu Ala Val
370 375 380

Lys Asp Lys Ala Ser Lys Ala Pro Phe Asp Gly Asn Leu Ser Val Ser
385 390 395 400

Glu Arg Ile Ala Asn Thr Cys Thr Asp Leu Gly Leu Ile Cys Arg Pro
405 410 415

Thr Gly Gln Ser Val Val Leu Cys Pro Pro Phe Ile Leu Thr Glu Ala
420 425 430

Gln Met Asp Glu Met Phe Asp Lys Leu Glu Lys Ala Leu Asp Lys Val
435 440 445

Phe Ala Glu Val Ala
450

<210> 77
<211> 1359

CX2-126USP1_ST25

<212> DNA

<213> Artificial Sequence

<220>

<223> Engineered variant of V. fluvialis transaminase

<400> 77

atgaacaaac cgcagagctg ggaaacgcgt gcggaaacct atagcctgta tggttttacc	60
gatatgccga gcctgcatca gcgtggcacc gtggtggtgg cccatggcga aggcccgat	120
atcgtggatg tgcattggccg tcgttatctg gatgcgaaca gcggcgcttg taacatggtg	180
gcgggctttg atcataaagg cctgattgat gcggcgaaag cgcagtatga acgttttccg	240
ggctatcatg cgttttcagg ccatatgagc gatcagaccg tgatgctgtc tgaaaaactg	300
gtggaagtga gcccgtttga tagcggccgt gtgttttata ccaacagcgg cagcgaagcg	360
aacgatacca tgggtgaaaat gctgtggttt ctgcatgcgg cggaaggcaa accgcagaaa	420
cgtaaaattc tgaccgcttg gaacgcgtat catggctgta ccgtagtgag cgcgagcatg	480
accggctttc cgtataacag cgtgtttggc ctgccgctgc cgggctttct gcatctgacc	540
tgcccgcatc attggcggtt tggcgaagaa ggcgaaaccg aagaacagtt tgcgcgcgt	600
ctggcccgtg aactggaaga aaccattcag aagggaaggc cgataccat tgcgggcttt	660
tttgcggaac cgggtgatggg tgctggcggg gttattccgc cggcgaaagg ctattttcag	720
gcgattctgc cgatcctgcg caaatatgat attccgggtg tcagcgatga agtgatttgc	780
ggctttggcc gtaccggtta cacctggggc tgctgacat atgattttac cccggatgcg	840
attattagca gtaaaaacct aaccgcgggt ttttttccgg taggcgcggg gattctgggt	900
ccggaactga gcaaacgtct ggaaaccgcg attgaagcga tcggcgaatt tccgcatggt	960
tttaccgcgg gcggccatcc ggtgggttgt gcgattgcgc tgaaagcgat tgatgtggtg	1020
atgaacgaag gcctggccga aaacgtgcgt cgtctggccc cgcgttttga agaacgtctg	1080
aaacatattg cggaacgtcc gaacattggc gaatatcgtg gcattggctt tatgtgggcg	1140
ctggaagcgg tgaaagataa agcgagcaaa gccccgtttg atggcaacct gagcgtgagc	1200
gaacgtattg cgaacacctg caccgatctg ggcctgattt gccgtccgac aggccagagc	1260
gtggttctgt gcccgcggtt tattctgacc gaagcgcaga tggatgaaat gttcgataaa	1320
ctggaaaaag cgctggataa agtggtttgcg gaagtggcg	1359

<210> 78

<211> 453

<212> PRT

<213> Artificial Sequence

<220>

<223> Engineered variant of V. fluvialis transaminase

<400> 78

Met	Asn	Lys	Pro	Gln	Ser	Trp	Glu	Thr	Arg	Ala	Glu	Thr	Tyr	Ser	Leu
1				5					10					15	

Tyr Gly Phe Thr Asp Met Pro Ser Leu His Gln Arg Gly Thr Val Val
 20 25 30
 Val Ala His Gly Glu Gly Pro Tyr Ile Val Asp Val His Gly Arg Arg
 35 40 45
 Tyr Leu Asp Ala Asn Ser Gly Ala Cys Asn Met Val Ala Gly Phe Asp
 50 55 60
 His Lys Gly Leu Ile Asp Ala Ala Lys Ala Gln Tyr Glu Arg Phe Pro
 65 70 75 80
 Gly Tyr His Ala Phe Ser Gly His Met Ser Asp Gln Thr Val Met Leu
 85 90 95
 Ser Glu Lys Leu Val Glu Val Ser Pro Phe Asp Ser Gly Arg Val Phe
 100 105 110
 Tyr Thr Asn Ser Gly Ser Glu Ala Asn Asp Thr Met Val Lys Met Leu
 115 120 125
 Trp Phe Leu His Ala Ala Glu Gly Lys Pro Gln Lys Arg Lys Ile Leu
 130 135 140
 Thr Arg Trp Asn Ala Tyr His Gly Cys Thr Val Val Ser Ala Ser Met
 145 150 155 160
 Thr Gly Phe Pro Tyr Asn Ser Val Phe Gly Leu Pro Leu Pro Gly Phe
 165 170 175
 Leu His Leu Thr Cys Pro His Tyr Trp Arg Tyr Gly Glu Glu Gly Glu
 180 185 190
 Thr Glu Glu Gln Phe Val Ala Arg Leu Ala Arg Glu Leu Glu Glu Thr
 195 200 205
 Ile Gln Lys Glu Gly Ala Asp Thr Ile Ala Gly Phe Phe Ala Glu Pro
 210 215 220
 Val Met Gly Ala Gly Gly Val Ile Pro Pro Ala Lys Gly Tyr Phe Gln
 225 230 235 240
 Ala Ile Leu Pro Ile Leu Arg Lys Tyr Asp Ile Pro Val Ile Ser Asp
 245 250 255
 Glu Val Ile Cys Gly Phe Gly Arg Thr Gly Asn Thr Trp Gly Cys Val
 260 265 270
 Thr Tyr Asp Phe Thr Pro Asp Ala Ile Ile Ser Ser Lys Asn Leu Thr
 275 280 285

CX2-126USP1_ST25

Ala Gly Phe Phe Pro Val Gly Ala Val Ile Leu Gly Pro Glu Leu Ser
290 295 300

Lys Arg Leu Glu Thr Ala Ile Glu Ala Ile Gly Glu Phe Pro His Gly
305 310 315 320

Phe Thr Ala Gly Gly His Pro Val Gly Cys Ala Ile Ala Leu Lys Ala
325 330 335

Ile Asp Val Val Met Asn Glu Gly Leu Ala Glu Asn Val Arg Arg Leu
340 345 350

Ala Pro Arg Phe Glu Glu Arg Leu Lys His Ile Ala Glu Arg Pro Asn
355 360 365

Ile Gly Glu Tyr Arg Gly Ile Gly Phe Met Trp Ala Leu Glu Ala Val
370 375 380

Lys Asp Lys Ala Ser Lys Ala Pro Phe Asp Gly Asn Leu Ser Val Ser
385 390 395 400

Glu Arg Ile Ala Asn Thr Cys Thr Asp Leu Gly Leu Ile Cys Arg Pro
405 410 415

Thr Gly Gln Ser Val Val Leu Cys Pro Pro Phe Ile Leu Thr Glu Ala
420 425 430

Gln Met Asp Glu Met Phe Asp Lys Leu Glu Lys Ala Leu Asp Lys Val
435 440 445

Phe Ala Glu Val Ala
450

<210> 79
<211> 1359
<212> DNA
<213> Artificial sequence

<220>
<223> Engineered variant of V. fluvialis transaminase

<400> 79
atgaacaaac cgcagagctg ggaaacgcgt gcggaaacct atagcctgta tggttttacc 60
gatatgccga gcctgcatca gcgtggcacc gtggtggtgg cccatggcga aggcccgtat 120
atcgtggatg tgcattggccg tcgttatctg gatgcgaaca gcggcgcttt gaacatgggt 180
gcgggctttg atcataaagg cctgattgat gcggcgaaaag cgcagtatga acgttttccg 240
ggctatcatg cgtttaaatg ccatatgagc gatcagaccg tgatgctgtc tgaaaaactg 300
gtggaagtga gcccgtttga tagcggccgt gtgttttata ccaacagcgg cagcgaagcg 360
aacgatacca tgggtgaaaat gctgtggttt ctgcatgcgg cggaaggcaa accgcagaaa 420
cgtaaaattc tgaccggttg gaacgcgtat catggctgta ccgtagtgag cgcgagcatg 480

CX2-126USP1_ST25

accggctttc cgtataacag cgtgtttggc ctgccgctgc cgggctttct gcatctgacc 540
 tgcccgcatt attggcggtta tggcgaagaa ggcgaaaccg aagaacagtt tgtcgcgcgt 600
 ctggcccgtg aactggaaga aaccattcag aaggaaggcg cggataccat tgcgggcttt 660
 tttgcggaac cggatgatggg tgctggcggg gttattccgc cggcgaaagg ctattttcag 720
 gcgattctgc cgatcctgcg caaatatgat attccgggtga tcagcgatga agtgatttgc 780
 ggctttggcc gtaccggtaa cacctggggc tgcgtgacct atgattttac cccggatgcg 840
 attattagca gtaaaaacct aaccgcgggt ttttttccgg taggcgcggg gattctgggt 900
 ccggaactga gcaaactctt ggaaaccgcg attgaagcga tcggcgaatt tccgcatggt 960
 tttaccgcgg gcggccatcc ggtgggttgt gcgattgcgc tgaaagcgat tgatgtggtg 1020
 atgaacgaag gcctggccga aaacgtgcgt cgtctggccc cgcgttttga agaactctg 1080
 aaacatattg cggaaactcc gaacattggc gaatatcgtg gcattggctt tatgtgggcg 1140
 ctggaagcgg tgaaagataa agcgagcaaa gccccgtttg atggcaacct gagcgtgagc 1200
 gaacgtattg cgaacacctg caccgatctg ggcctgattt gccgtccgac aggccagagc 1260
 gtggttctgt gcccgcggtt tattctgacc gaagcgcaga tggatgaaat gttcgataaa 1320
 ctggaaaaag cgctggataa agtgtttgcg gaagtggcg 1359

<210> 80

<211> 453

<212> PRT

<213> Artificial Sequence

<220>

<223> Engineered variant of *V. fluvialis* transaminase

<400> 80

Met Asn Lys Pro Gln Ser Trp Glu Thr Arg Ala Glu Thr Tyr Ser Leu
 1 5 10 15

Tyr Gly Phe Thr Asp Met Pro Ser Leu His Gln Arg Gly Thr Val Val
 20 25 30

Val Ala His Gly Glu Gly Pro Tyr Ile Val Asp Val His Gly Arg Arg
 35 40 45

Tyr Leu Asp Ala Asn Ser Gly Ala Leu Asn Met Val Ala Gly Phe Asp
 50 55 60

His Lys Gly Leu Ile Asp Ala Ala Lys Ala Gln Tyr Glu Arg Phe Pro
 65 70 75 80

Gly Tyr His Ala Phe Asn Gly His Met Ser Asp Gln Thr Val Met Leu
 85 90 95

Ser Glu Lys Leu Val Glu Val Ser Pro Phe Asp Ser Gly Arg Val Phe
 100 105 110

CX2-126USP1_ST25

Tyr Thr Asn Ser Gly Ser Glu Ala Asn Asp Thr Met Val Lys Met Leu
 115 120 125
 Trp Phe Leu His Ala Ala Glu Gly Lys Pro Gln Lys Arg Lys Ile Leu
 130 135 140
 Thr Arg Trp Asn Ala Tyr His Gly Cys Thr Val Val Ser Ala Ser Met
 145 150 155 160
 Thr Gly Phe Pro Tyr Asn Ser Val Phe Gly Leu Pro Leu Pro Gly Phe
 165 170 175
 Leu His Leu Thr Cys Pro His Tyr Trp Arg Tyr Gly Glu Glu Gly Glu
 180 185 190
 Thr Glu Glu Gln Phe Val Ala Arg Leu Ala Arg Glu Leu Glu Glu Thr
 195 200 205
 Ile Gln Lys Glu Gly Ala Asp Thr Ile Ala Gly Phe Phe Ala Glu Pro
 210 215 220
 Val Met Gly Ala Gly Gly Val Ile Pro Pro Ala Lys Gly Tyr Phe Gln
 225 230 235 240
 Ala Ile Leu Pro Ile Leu Arg Lys Tyr Asp Ile Pro Val Ile Ser Asp
 245 250 255
 Glu Val Ile Cys Gly Phe Gly Arg Thr Gly Asn Thr Trp Gly Cys Val
 260 265 270
 Thr Tyr Asp Phe Thr Pro Asp Ala Ile Ile Ser Ser Lys Asn Leu Thr
 275 280 285
 Ala Gly Phe Phe Pro Val Gly Ala Val Ile Leu Gly Pro Glu Leu Ser
 290 295 300
 Lys Arg Leu Glu Thr Ala Ile Glu Ala Ile Gly Glu Phe Pro His Gly
 305 310 315 320
 Phe Thr Ala Gly Gly His Pro Val Gly Cys Ala Ile Ala Leu Lys Ala
 325 330 335
 Ile Asp Val Val Met Asn Glu Gly Leu Ala Glu Asn Val Arg Arg Leu
 340 345 350
 Ala Pro Arg Phe Glu Glu Arg Leu Lys His Ile Ala Glu Arg Pro Asn
 355 360 365
 Ile Gly Glu Tyr Arg Gly Ile Gly Phe Met Trp Ala Leu Glu Ala Val
 370 375 380

CX2-126USP1_ST25

Lys Asp Lys Ala Ser Lys Ala Pro Phe Asp Gly Asn Leu Ser Val Ser
385 390 395 400

Glu Arg Ile Ala Asn Thr Cys Thr Asp Leu Gly Leu Ile Cys Arg Pro
405 410 415

Thr Gly Gln Ser Val Val Leu Cys Pro Pro Phe Ile Leu Thr Glu Ala
420 425 430

Gln Met Asp Glu Met Phe Asp Lys Leu Glu Lys Ala Leu Asp Lys Val
435 440 445

Phe Ala Glu Val Ala
450

<210> 81
<211> 1359
<212> DNA
<213> Artificial Sequence

<220>
<223> Engineered variant of *V. fluvialis* transaminase

<400> 81
atgaacaaac cgcagagctg ggaaacgcgt gcggaaacct atagcctgta tggttttacc 60
gatatgccga gcctgcatca gcgtggcacc gtggtggtgg cccatggcga aggcccgat 120
atcgtggatg tgcattggccg tcgttatctg gatgcgaaca gcggcgcttt gaacatggtg 180
gcgggctttg atcataaagg cctgattgat gcggcgaaag cgcagtatga acgttttccg 240
ggctatcatg cgttttcagg ccatatgagc gatcagaccg tgatgctgtc tgaaaaactg 300
gtggaagtga gcccgtttga tagcggccgt gtgttttata ccaacagcgg cagcgaagcg 360
aacgatacca tgggtgaaaat gctgtggttt ctgcatgcgg cggaaggcaa accgcagaaa 420
cgtaaaattc tgaccggtg gaacgcgtat catggctgta ccgtagtgag cgcgagcatg 480
accggccttc cgtataacag cgtgtttggc ctgccgctgc cgggctttct gcatctgacc 540
tgcccgcatc attggcggtt tggcgaagaa ggcgaaaccg aagaacagtt tgcgcgcgt 600
ctggcccgtg aactggaaga aaccattcag aagggaaggc cgataccat tgcgggcttt 660
tttgcggaac cgggtgatggg tgctggcggg gttattccgc cggcgaaagg ctattttcag 720
gcgattctgc cgatcctgcg caaatatgat attccgggtg tcagcgatga agtgatttgc 780
ggctttggcc gtaccggtta cacctggggc tgcgtgacct atgattttac cccggatgcg 840
attattagca gtaaaaacct aaccgcgggt ttttttccgg taggcgcggg gattctgggt 900
ccggaactga gcaaactgtt ggaaaccgcg attgaagcga tcggcgaatt tccgcatggt 960
tttaccacgg gcggccatcc ggtgggttgt gcgattgcgc tgaaagcgat tgatgtggtg 1020
atgaacgaag gcctggccga aaacgtgcgt cgtctggccc cgcgttttga agaactctg 1080
aaacatatgt cggaacgtcc gaacattggc gaatatcgtg gcattggctt tatgtgggcg 1140

CX2-126USP1_ST25

ctggaagcgg tgaagataa agcgagcaaa gccccgtttg atggcaacct gagcgtgagc 1200
 gaacgtattg cgaacacctg caccgatctg ggcttgattt gccgtccgac aggccagagc 1260
 gtggttctgt gcccgccgtt tattctgacc gaagcgcaga cggatgaaat gttcgataaa 1320
 ctggaaaaag cgctggataa agtgtttgcg gaagtggcg 1359

<210> 82
 <211> 453
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> Engineered variant of V. fluvialis transaminase

<400> 82

Met Asn Lys Pro Gln Ser Trp Glu Thr Arg Ala Glu Thr Tyr Ser Leu
 1 5 10 15

Tyr Gly Phe Thr Asp Met Pro Ser Leu His Gln Arg Gly Thr Val Val
 20 25 30

Val Ala His Gly Glu Gly Pro Tyr Ile Val Asp Val His Gly Arg Arg
 35 40 45

Tyr Leu Asp Ala Asn Ser Gly Ala Leu Asn Met Val Ala Gly Phe Asp
 50 55 60

His Lys Gly Leu Ile Asp Ala Ala Lys Ala Gln Tyr Glu Arg Phe Pro
 65 70 75 80

Gly Tyr His Ala Phe Ser Gly His Met Ser Asp Gln Thr Val Met Leu
 85 90 95

Ser Glu Lys Leu Val Glu Val Ser Pro Phe Asp Ser Gly Arg Val Phe
 100 105 110

Tyr Thr Asn Ser Gly Ser Glu Ala Asn Asp Thr Met Val Lys Met Leu
 115 120 125

Trp Phe Leu His Ala Ala Glu Gly Lys Pro Gln Lys Arg Lys Ile Leu
 130 135 140

Thr Arg Trp Asn Ala Tyr His Gly Cys Thr Val Val Ser Ala Ser Met
 145 150 155 160

Thr Gly Leu Pro Tyr Asn Ser Val Phe Gly Leu Pro Leu Pro Gly Phe
 165 170 175

Leu His Leu Thr Cys Pro His Tyr Trp Arg Tyr Gly Glu Glu Gly Glu
 180 185 190

CX2-126USP1_ST25

Thr Glu Glu Gln Phe Val Ala Arg Leu Ala Arg Glu Leu Glu Glu Thr
195 200 205

Ile Gln Lys Glu Gly Ala Asp Thr Ile Ala Gly Phe Phe Ala Glu Pro
210 215 220

Val Met Gly Ala Gly Gly Val Ile Pro Pro Ala Lys Gly Tyr Phe Gln
225 230 235 240

Ala Ile Leu Pro Ile Leu Arg Lys Tyr Asp Ile Pro Val Ile Ser Asp
245 250 255

Glu Val Ile Cys Gly Phe Gly Arg Thr Gly Asn Thr Trp Gly Cys Val
260 265 270

Thr Tyr Asp Phe Thr Pro Asp Ala Ile Ile Ser Ser Lys Asn Leu Thr
275 280 285

Ala Gly Phe Phe Pro Val Gly Ala Val Ile Leu Gly Pro Glu Leu Ser
290 295 300

Lys Arg Leu Glu Thr Ala Ile Glu Ala Ile Gly Glu Phe Pro His Gly
305 310 315 320

Phe Thr Thr Gly Gly His Pro Val Gly Cys Ala Ile Ala Leu Lys Ala
325 330 335

Ile Asp Val Val Met Asn Glu Gly Leu Ala Glu Asn Val Arg Arg Leu
340 345 350

Ala Pro Arg Phe Glu Glu Arg Leu Lys His Ile Ala Glu Arg Pro Asn
355 360 365

Ile Gly Glu Tyr Arg Gly Ile Gly Phe Met Trp Ala Leu Glu Ala Val
370 375 380

Lys Asp Lys Ala Ser Lys Ala Pro Phe Asp Gly Asn Leu Ser Val Ser
385 390 395 400

Glu Arg Ile Ala Asn Thr Cys Thr Asp Leu Gly Leu Ile Cys Arg Pro
405 410 415

Thr Gly Gln Ser Val Val Leu Cys Pro Pro Phe Ile Leu Thr Glu Ala
420 425 430

Gln Thr Asp Glu Met Phe Asp Lys Leu Glu Lys Ala Leu Asp Lys Val
435 440 445

Phe Ala Glu Val Ala
450

CX2-126USP1_ST25

<210> 83
 <211> 1359
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Engineered variant of *V. fluvialis* transaminase

<400> 83
 atgaacaaac cgagagctg ggaaacgcgt gcggaaacct atagcctgta tggttttacc 60
 gatatgccga gcctgcatca gcgtggcacc gtggtggtgg cccatggcga agggccgtat 120
 atcgtggatg tgcattggcg tcgttatctg gatgcgaaca gcggcgcttt gaacatggtg 180
 gcgggctttg atcataaagg cctgattgat gcggcgaaaag cgagtatga acgttttccg 240
 ggctatcatg cgttttccagg ccatatgagc gatcagaccg tgatgctgtc tgaaaaactg 300
 gtggaagtga gcccgtttga tagcggccgt gtgttttata ccaacagcgg cagcgaagcg 360
 aacgatacca tgggtgaaaat gctgtggttt ctgcatgcgg cggaaggcaa accgcagaaa 420
 cgtaaaattc tgaccggttg gaacgcgtat catggctgta ccgtagtgag cgcgagcatg 480
 accggctttc cgtataacag cgtgtttggc ctgccgctgc cgggctttct gcatctgacc 540
 tgcccgcatc attggcggtt tggcgaagaa ggcgaaaccg aagaacagtt tgtcgcgcgt 600
 ctggcccgtg aactggaaga aaccattcag aagggaaggcg cggataccat tgcgggcttt 660
 tttgcggaac cgggtgatggg tgctggcggg gttattccgc cggcgaaagg ctattttcag 720
 gcgattctgc cgatcctgcg caaatatgat attccggtga tcagcgatga agtgatttgc 780
 ggctttggcc gtaccggtaa cacctggggc tgcgtgacct atgattttac cccggatgcg 840
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 ccggaactga gcaaactgtt ggaaaccgcg attgaagcga tcggcggaatt tccgcatggt 960
 tttaccgcgg gcggccatcc ggtgggttgt gcgattgcgc tgaaagcgat tgatgtggtg 1020
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 aaacatattg cggaaactcc gaacattggc gaatatctg gcattggctt tatgtgggcg 1140
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 gaacgtattg cgaacacctg caccgatctg ggcctgattt gcttgccgac aggccagagc 1260
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 ctggaaaaag cgctggataa agtgtttgcg gaagtggcg 1359

<210> 84
 <211> 453
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> Engineered variant of *V. fluvialis* transaminase

<400> 84

Met Asn Lys Pro Gln Ser Trp Glu Thr Arg Ala Glu Thr Tyr Ser Leu
 1 5 10 15

CX2-126USP1_ST25

Tyr Gly Phe Thr Asp Met Pro Ser Leu His Gln Arg Gly Thr Val Val
 20 25 30
 Val Ala His Gly Glu Gly Pro Tyr Ile Val Asp Val His Gly Arg Arg
 35 40 45
 Tyr Leu Asp Ala Asn Ser Gly Ala Leu Asn Met Val Ala Gly Phe Asp
 50 55 60
 His Lys Gly Leu Ile Asp Ala Ala Lys Ala Gln Tyr Glu Arg Phe Pro
 65 70 75 80
 Gly Tyr His Ala Phe Ser Gly His Met Ser Asp Gln Thr Val Met Leu
 85 90 95
 Ser Glu Lys Leu Val Glu Val Ser Pro Phe Asp Ser Gly Arg Val Phe
 100 105 110
 Tyr Thr Asn Ser Gly Ser Glu Ala Asn Asp Thr Met Val Lys Met Leu
 115 120 125
 Trp Phe Leu His Ala Ala Glu Gly Lys Pro Gln Lys Arg Lys Ile Leu
 130 135 140
 Thr Arg Trp Asn Ala Tyr His Gly Cys Thr Val Val Ser Ala Ser Met
 145 150 155 160
 Thr Gly Phe Pro Tyr Asn Ser Val Phe Gly Leu Pro Leu Pro Gly Phe
 165 170 175
 Leu His Leu Thr Cys Pro His Tyr Trp Arg Tyr Gly Glu Glu Gly Glu
 180 185 190
 Thr Glu Glu Gln Phe Val Ala Arg Leu Ala Arg Glu Leu Glu Glu Thr
 195 200 205
 Ile Gln Lys Glu Gly Ala Asp Thr Ile Ala Gly Phe Phe Ala Glu Pro
 210 215 220
 Val Met Gly Ala Gly Gly Val Ile Pro Pro Ala Lys Gly Tyr Phe Gln
 225 230 235 240
 Ala Ile Leu Pro Ile Leu Arg Lys Tyr Asp Ile Pro Val Ile Ser Asp
 245 250 255
 Glu Val Ile Cys Gly Phe Gly Arg Thr Gly Asn Thr Trp Gly Cys Val
 260 265 270
 Thr Tyr Asp Phe Thr Pro Asp Ala Ile Ile Ser Ser Lys Asn Leu Thr
 275 280 285

CX2-126USP1_ST25

Ala Gly Phe Phe Pro Val Gly Ala Val Ile Leu Gly Pro Glu Leu Ser
290 295 300

Lys Arg Leu Glu Thr Ala Ile Glu Ala Ile Gly Glu Phe Pro His Gly
305 310 315 320

Phe Thr Ala Gly Gly His Pro Val Gly Cys Ala Ile Ala Leu Lys Ala
325 330 335

Ile Asp Val Val Met Asn Glu Gly Leu Ala Glu Asn Val Arg Arg Leu
340 345 350

Ala Pro Arg Phe Glu Glu Arg Leu Lys His Ile Ala Glu Arg Pro Asn
355 360 365

Ile Gly Glu Tyr Arg Gly Ile Gly Phe Met Trp Ala Leu Glu Ala Val
370 375 380

Lys Asp Lys Ala Ser Lys Ala Pro Phe Asp Gly Asn Leu Ser Val Ser
385 390 395 400

Glu Arg Ile Ala Asn Thr Cys Thr Asp Leu Gly Leu Ile Cys Leu Pro
405 410 415

Thr Gly Gln Ser Val Val Leu Cys Pro Pro Phe Ile Leu Thr Glu Ala
420 425 430

Gln Met Asp Glu Met Phe Asp Lys Leu Glu Lys Ala Leu Asp Lys Val
435 440 445

Phe Ala Glu Val Ala
450

<210> 85
<211> 1359
<212> DNA
<213> Artificial Sequence

<220>
<223> Engineered variant of v. fluvialis transaminase

<400> 85
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atcgtggatg tgcattggcg tcgttatctg gatgcgaaca gcggcgcttt gaacatggtg 180
gcgggctttg atcataaagg cctgattgat gcggcgaaaag cgcagtatga acgttttccg 240
ggctatcatg cgttttcagg ccatatgagc gatcagaccg tgatgctgtc tgaaaaactg 300
gtggaagtga gcccgtttga tagcggccgt gtgttttata ccaacagcgg cagcgaagcg 360
aacgatacca tggtgaaaat gctgtggttt ctgcatgcgg cggaaggcaa accgcagaaa 420
Page 113

CX2-126USP1_ST25

cgtaaaattc tgacccgttg gaacgcgtat catggctgta ccgtagtgag cgcgagcatg 480
accggctttc cgtataacag cgtgtttggc ctgccgctgc cgggctttct gcatctgacc 540
tgcccgcatt attggcgtaa tggcgaagaa ggcgaaaccg aagaacagtt tgtcgcgcgt 600
ctggcccgtg aactggaaga aaccattcag aaggaaggcg cggataccat tgcgggcttt 660
tttgcggaac cggatgatggg tgctggcggg gttattccgc cggcgaaagg ctattttcag 720
gcgattctgc cgatcctgcg caaatatgat attccgggtga tcagcgatga agtgatttgc 780
ggctttggcc gtaccggtaa cacctggggc tgcgtgacct atgattttac cccggatgcg 840
attattagca gtaaaaacct aaccgcgggt ttttttccgg taggcgcggg gattctgggt 900
ccggaactga gcaaactgtc ggaaaccgcg attgaagcga tcggcgaatt tccgcatggg 960
tttaccgcgg gcggccatcc ggtgggttgt gcgattgcgc tgaaagcgat tgatgtggtg 1020
atgaacgaag gcctggccga aaacgtgcgt cgtctggccc cgcgttttga agaactctg 1080
aaacatattg cggaactgcc gaacattggc gaatatcgtg gcattggcct tatgtgggcg 1140
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gaacgtattg cgaacacctg caccgatctg ggcttgattt gccatccgac aggccagagc 1260
gtggttctgt gcccgcggtt tattctgacc gaagcgcaga tggatgaaat gttcgataaa 1320
ctggaaaaag cgctggataa agtgtttgcg gaagtggcg 1359

<210> 86
<211> 453
<212> PRT
<213> Artificial sequence

<220>
<223> Engineered variant of v. fluvialis transaminase

<400> 86

Met Asn Lys Pro Gln Ser Trp Glu Thr Arg Ala Glu Thr Tyr Ser Leu
1 5 10 15

Tyr Gly Phe Thr Asp Met Pro Ser Leu His Gln Arg Gly Thr Val Val
20 25 30

Val Ala His Gly Glu Gly Pro Tyr Ile Val Asp Val His Gly Arg Arg
35 40 45

Tyr Leu Asp Ala Asn Ser Gly Ala Leu Asn Met Val Ala Gly Phe Asp
50 55 60

His Lys Gly Leu Ile Asp Ala Ala Lys Ala Gln Tyr Glu Arg Phe Pro
65 70 75 80

Gly Tyr His Ala Phe Ser Gly His Met Ser Asp Gln Thr Val Met Leu
85 90 95

CX2-126USP1_ST25

Ser Glu Lys Leu Val Glu Val Ser Pro Phe Asp Ser Gly Arg Val Phe
100 105 110

Tyr Thr Asn Ser Gly Ser Glu Ala Asn Asp Thr Met Val Lys Met Leu
115 120 125

Trp Phe Leu His Ala Ala Glu Gly Lys Pro Gln Lys Arg Lys Ile Leu
130 135 140

Thr Arg Trp Asn Ala Tyr His Gly Cys Thr Val Val Ser Ala Ser Met
145 150 155 160

Thr Gly Phe Pro Tyr Asn Ser Val Phe Gly Leu Pro Leu Pro Gly Phe
165 170 175

Leu His Leu Thr Cys Pro His Tyr Trp Arg Tyr Gly Glu Glu Gly Glu
180 185 190

Thr Glu Glu Gln Phe Val Ala Arg Leu Ala Arg Glu Leu Glu Glu Thr
195 200 205

Ile Gln Lys Glu Gly Ala Asp Thr Ile Ala Gly Phe Phe Ala Glu Pro
210 215 220

Val Met Gly Ala Gly Gly Val Ile Pro Pro Ala Lys Gly Tyr Phe Gln
225 230 235 240

Ala Ile Leu Pro Ile Leu Arg Lys Tyr Asp Ile Pro Val Ile Ser Asp
245 250 255

Glu Val Ile Cys Gly Phe Gly Arg Thr Gly Asn Thr Trp Gly Cys Val
260 265 270

Thr Tyr Asp Phe Thr Pro Asp Ala Ile Ile Ser Ser Lys Asn Leu Thr
275 280 285

Ala Gly Phe Phe Pro Val Gly Ala Val Ile Leu Gly Pro Glu Leu Ser
290 295 300

Lys Arg Leu Glu Thr Ala Ile Glu Ala Ile Gly Glu Phe Pro His Gly
305 310 315 320

Phe Thr Ala Gly Gly His Pro Val Gly Cys Ala Ile Ala Leu Lys Ala
325 330 335

Ile Asp Val Val Met Asn Glu Gly Leu Ala Glu Asn Val Arg Arg Leu
340 345 350

Ala Pro Arg Phe Glu Glu Arg Leu Lys His Ile Ala Glu Arg Pro Asn
355 360 365

CX2-126USP1_ST25

Ile Gly Glu Tyr Arg Gly Ile Gly Phe Met Trp Ala Leu Glu Ala Val
 370 375 380

Lys Asp Lys Ala Ser Lys Ala Pro Phe Asp Gly Asn Leu Ser Val Ser
 385 390 395 400

Glu Arg Ile Ala Asn Thr Cys Thr Asp Leu Gly Leu Ile Cys His Pro
 405 410 415

Thr Gly Gln Ser Val Val Leu Cys Pro Pro Phe Ile Leu Thr Glu Ala
 420 425 430

Gln Met Asp Glu Met Phe Asp Lys Leu Glu Lys Ala Leu Asp Lys Val
 435 440 445

Phe Ala Glu Val Ala
 450

<210> 87
 <211> 1359
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Engineered variant of V. fluvialis transaminase

<400> 87
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 gatatgccga gcctgcatca gcgtggcacc gtggtggtgg cccatggcga aggcccgat 120
 atcgtggatg tgcattggcg tcgttatctg gatgcgaaca gcggcgcttt gaacatggtg 180
 gcgggctttg atcataaagg cctgattgat gcggcgaaag cgcagtatga acgttttccg 240
 ggctatcatg cgttttcagg ccatatgagc gatcagaccg tgatgctgtc tgaaaaactg 300
 gtggaagtga gcccgtttga tagcggccgt gtgttttata ccaacagcgg cagcgaagcg 360
 aacgatacca tgggtgaaaat gctgtggttt ctgcatgcgg cggaaggcaa accgcagaaa 420
 cgtaaaattc tgaccggtt gaacgcgtat catggctgta ccgtagtgag cgcgagcatg 480
 accggctttc cgtataacag cgtgtttggc ctgccgctgc cgggctttct gcatctgacc 540
 tgcccgcat attggcggtta tggcgaagaa ggcgaaaccg aagaacagtt tgtcgcgcgt 600
 ctggcccgtg aactggaaga aaccattcag aagggaaggcg cggataccat tgcgggcttt 660
 tttgcggaac cggatgatggg tgctggcggg gttattccgc cggcgaaagg ctattttcag 720
 gcgattctgc cgatcctgcg caaatatgat attccggtga tcagcgatga agtgatttgc 780
 ggctttggcc gtaccggtaa cgcttggggc tgcgtgacct atgattttac cccggatgcg 840
 attattagca gtaaaaacct aaccgcgggt ttttttccgg taggcgcggg gattctgggt 900
 ccggaactga gcaaacgtct ggaaaccgcg attgaagcga tcggcgaatt tccgcatggt 960
 tttaccgcgg gcggccatcc ggtgggttgt gcgattgcgc tgaaagcgat tgatgtggtg 1020
 atgaacgaag gcctggccga aaacgtgcgt cgtctggccc cgcgttttga agaacgtctg 1080

CX2-126USP1_ST25

aaacatat	cggaacgtcc	gaacattggc	gaatatcgtg	gcattggctt	tatgtggg	cg	1140
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gaacgtatt	cgaacacctg	caccgatctg	ggcctgattt	gccgtccgac	aggccagagc		1260
gtggttct	gtg	gcccgccgtt	tattctgacc	gaagcgcaga	tggatgaaat	gttcgataaa	1320
ctggaaaa	aag	cgctggataa	agtgtttg	cg	gaagtggcg		1359

<210> 88
 <211> 453
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> Engineered variant of V. fluvialis transaminase
 <400> 88

Met Asn Lys Pro Gln Ser Trp Glu Thr Arg Ala Glu Thr Tyr Ser Leu
 1 5 10 15

Tyr Gly Phe Thr Asp Met Pro Ser Leu His Gln Arg Gly Thr Val Val
 20 25 30

Val Ala His Gly Glu Gly Pro Tyr Ile Val Asp Val His Gly Arg Arg
 35 40 45

Tyr Leu Asp Ala Asn Ser Gly Ala Leu Asn Met Val Ala Gly Phe Asp
 50 55 60

His Lys Gly Leu Ile Asp Ala Ala Lys Ala Gln Tyr Glu Arg Phe Pro
 65 70 75 80

Gly Tyr His Ala Phe Ser Gly His Met Ser Asp Gln Thr Val Met Leu
 85 90 95

Ser Glu Lys Leu Val Glu Val Ser Pro Phe Asp Ser Gly Arg Val Phe
 100 105 110

Tyr Thr Asn Ser Gly Ser Glu Ala Asn Asp Thr Met Val Lys Met Leu
 115 120 125

Trp Phe Leu His Ala Ala Glu Gly Lys Pro Gln Lys Arg Lys Ile Leu
 130 135 140

Thr Arg Trp Asn Ala Tyr His Gly Cys Thr Val Val Ser Ala Ser Met
 145 150 155 160

Thr Gly Phe Pro Tyr Asn Ser Val Phe Gly Leu Pro Leu Pro Gly Phe
 165 170 175

Leu His Leu Thr Cys Pro His Tyr Trp Arg Tyr Gly Glu Glu Gly Glu
 180 185 190

CX2-126USP1_ST25

Thr Glu Glu Gln Phe Val Ala Arg Leu Ala Arg Glu Leu Glu Glu Thr
 195 200 205
 Ile Gln Lys Glu Gly Ala Asp Thr Ile Ala Gly Phe Phe Ala Glu Pro
 210 215 220
 Val Met Gly Ala Gly Gly Val Ile Pro Pro Ala Lys Gly Tyr Phe Gln
 225 230 235 240
 Ala Ile Leu Pro Ile Leu Arg Lys Tyr Asp Ile Pro Val Ile Ser Asp
 245 250 255
 Glu Val Ile Cys Gly Phe Gly Arg Thr Gly Asn Ala Trp Gly Cys Val
 260 265 270
 Thr Tyr Asp Phe Thr Pro Asp Ala Ile Ile Ser Ser Lys Asn Leu Thr
 275 280 285
 Ala Gly Phe Phe Pro Val Gly Ala Val Ile Leu Gly Pro Glu Leu Ser
 290 295 300
 Lys Arg Leu Glu Thr Ala Ile Glu Ala Ile Gly Glu Phe Pro His Gly
 305 310 315 320
 Phe Thr Ala Gly Gly His Pro Val Gly Cys Ala Ile Ala Leu Lys Ala
 325 330 335
 Ile Asp Val Val Met Asn Glu Gly Leu Ala Glu Asn Val Arg Arg Leu
 340 345 350
 Ala Pro Arg Phe Glu Glu Arg Leu Lys His Ile Ala Glu Arg Pro Asn
 355 360 365
 Ile Gly Glu Tyr Arg Gly Ile Gly Phe Met Trp Ala Leu Glu Phe Val
 370 375 380
 Lys Asp Lys Ala Ser Lys Ala Pro Phe Asp Gly Asn Leu Ser Val Ser
 385 390 395 400
 Glu Arg Ile Ala Asn Thr Cys Thr Asp Leu Gly Leu Ile Cys Arg Pro
 405 410 415
 Thr Gly Gln Ser Val Val Leu Cys Pro Pro Phe Ile Leu Thr Glu Ala
 420 425 430
 Gln Met Asp Glu Met Phe Asp Lys Leu Glu Lys Ala Leu Asp Lys Val
 435 440 445
 Phe Ala Glu Val Ala
 450

<210> 89
 <211> 1359
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Engineered variant of *V. fluvialis* transaminase

<400> 89
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 gatatgccga gcctgcatca gcgtggcacc gtggtggtgg cccatggcga agggccgtat 120
 atcgtggatg tgcattggcg tcgttatctg gatgcgaaca gcggcgcttt gaacatggtg 180
 gcgggctttg atcataaagg cctgattgat gcggcgaaaag cgcagtatga acgttttccg 240
 ggctatcatg cgttttcagg ccatatgagc gatcagaccg tgatgctgtc tgaaaaactg 300
 gtggaagtga gcccgtttga tagcggccgt gtgttttata ccaacagcgg cagcgaagcg 360
 aacgatacca tgggtgaaaat gctgtggttt ctgcatgcgg cggaaggcaa accgcagaaa 420
 cgtaaaattc tgaccggtt gaacgcgtat catggctgta ccgtagtgag cgcgagcatg 480
 accggctttc cgtataacag cgtgtttggc ctgccgctgc cgggctttct gcatctgacc 540
 tgcccgcatt attggcggtt tggcgaagaa ggcgaaaccg aagaacagtt tgtcgcgcgt 600
 ctggcccgtg aactggaaga aaccattcag aaggaaaggcg cggataccat tgcgggcttt 660
 tttgcggaac cgggtgatggg tgctggcggg gttattccgc cggcgaaaagg ctattttcag 720
 gcgattctgc cgatcctgcg caaatatgat attccggtga tcagcgatga agtgatttgc 780
 ggctttggcc gtaccggtaa cacctggggc tgcgtgacct atgattttac cccggatgcg 840
 attattagca gtaaaccatct aaccgcgggt ttttttccgg taggcgcggg gattctgggt 900
 ccggaactga gcaaaccgtc ggaaaccgcg attgaagcga tcggcgaatt tccgcatggt 960
 tttaccgcgg gcggccatcc ggtgggttgt gcgattgcgc tgaaagcgat tgatgtggtg 1020
 atgaacgaag gcctggccga aaacgtgcgt cgtctggccc cgcgttttga agaacgtctg 1080
 aaacatatat cggaacgtcc gaacattggc gaatatcgtg gcattggctt tatgtgggcg 1140
 ctggaagcgg tgaaagataa agcgagcaaa gccccgtttg atggcaacct gagcgtgagc 1200
 gaacgtattg cgaacacctg caccgatctg ggcctgattt gccgtccgac aggccagagc 1260
 gtggttctgt gcccgcggtt tattctgacc gaagcgcaga tggatgaaat gttcgataaa 1320
 ctggaaaaag cgctggataa agtggttgcg gaagtggcg 1359

<210> 90
 <211> 453
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> Engineered variant of *V. fluvialis* transaminase

<400> 90

CX2-126USP1_ST25

Met Asn Lys Pro Gln Ser Trp Glu Thr Arg Ala Glu Thr Tyr Ser Leu
1 5 10 15

Tyr Gly Phe Thr Asp Met Pro Ser Leu His Gln Arg Gly Thr Val Val
20 25 30

Val Ala His Gly Glu Gly Pro Tyr Ile Val Asp Val His Gly Arg Arg
35 40 45

Tyr Leu Asp Ala Asn Ser Gly Ala Leu Asn Met Val Ala Gly Phe Asp
50 55 60

His Lys Gly Leu Ile Asp Ala Ala Lys Ala Gln Tyr Glu Arg Phe Pro
65 70 75 80

Gly Tyr His Ala Phe Ser Gly His Met Ser Asp Gln Thr Val Met Leu
85 90 95

Ser Glu Lys Leu Val Glu Val Ser Pro Phe Asp Ser Gly Arg Val Phe
100 105 110

Tyr Thr Asn Ser Gly Ser Glu Ala Asn Asp Thr Met Val Lys Met Leu
115 120 125

Trp Phe Leu His Ala Ala Glu Gly Lys Pro Gln Lys Arg Lys Ile Leu
130 135 140

Thr Arg Trp Asn Ala Tyr His Gly Cys Thr Val Val Ser Ala Ser Met
145 150 155 160

Thr Gly Phe Pro Tyr Asn Ser Val Phe Gly Leu Pro Leu Pro Gly Phe
165 170 175

Leu His Leu Thr Cys Pro His Tyr Trp Arg Tyr Gly Glu Glu Gly Glu
180 185 190

Thr Glu Glu Gln Phe Val Ala Arg Leu Ala Arg Glu Leu Glu Glu Thr
195 200 205

Ile Gln Lys Glu Gly Ala Asp Thr Ile Ala Gly Phe Phe Ala Glu Pro
210 215 220

Val Met Gly Ala Gly Gly Val Ile Pro Pro Ala Lys Gly Tyr Phe Gln
225 230 235 240

Ala Ile Leu Pro Ile Leu Arg Lys Tyr Asp Ile Pro Val Ile Ser Asp
245 250 255

Glu Val Ile Cys Gly Phe Gly Arg Thr Gly Asn Thr Trp Gly Cys Val
260 265 270

CX2-126USP1_ST25

Thr Tyr Asp Phe Thr Pro Asp Ala Ile Ile Ser Ser Lys His Leu Thr
275 280 285

Ala Gly Phe Phe Pro Val Gly Ala Val Ile Leu Gly Pro Glu Leu Ser
290 295 300

Lys Arg Leu Glu Thr Ala Ile Glu Ala Ile Gly Glu Phe Pro His Gly
305 310 315 320

Phe Thr Ala Gly Gly His Pro Val Gly Cys Ala Ile Ala Leu Lys Ala
325 330 335

Ile Asp Val Val Met Asn Glu Gly Leu Ala Glu Asn Val Arg Arg Leu
340 345 350

Ala Pro Arg Phe Glu Glu Arg Leu Lys His Ile Ala Glu Arg Pro Asn
355 360 365

Ile Gly Glu Tyr Arg Gly Ile Gly Phe Met Trp Ala Leu Glu Ala Val
370 375 380

Lys Asp Lys Ala Ser Lys Ala Pro Phe Asp Gly Asn Leu Ser Val Ser
385 390 395 400

Glu Arg Ile Ala Asn Thr Cys Thr Asp Leu Gly Leu Ile Cys Arg Pro
405 410 415

Thr Gly Gln Ser Val Val Leu Cys Pro Pro Phe Ile Leu Thr Glu Ala
420 425 430

Gln Met Asp Glu Met Phe Asp Lys Leu Glu Lys Ala Leu Asp Lys Val
435 440 445

Phe Ala Glu Val Ala
450

<210> 91
<211> 1359
<212> DNA
<213> Artificial Sequence

<220>
<223> Engineered variant of V. fluvialis transaminase

<400> 91
atgaacaaac cgcagagctg ggaaacgcgt gcggaaacct atagcctgta tggttttacc 60
gatatgccga gcctgcatca gcgtggcacc gtggtggtgg cccatggcga aggcccgat 120
atcgtggatg tgcattggccg tcgttatctg gatgcgaaca gcggcgcttt gaacatggtg 180
gcgggctttg atcataaagg cctgattgat gcggcgaaag cgagtatga acgttttccg 240
ggctatcatg cgttttcagg ccatatgagc gatcagaccg tgatgctgtc tgaaaaactg 300
gtggaagtga gcccgtttga tagcggccgt gtgttttata ccaacagcgg cagcgaagcg 360

CX2-126USP1_ST25

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aacgatacca tgggtgaaaat gctgtggttt ctgcatgcgg cggaaggcaa accgcagaaa      420
cgtaaaattc tgacccgttg gaacgcgtat catggctgta ccgtagtgag cgcgagcatg      480
accggctttc cgtataacag cgtgtttggc ctgccgctgc cgggctttct gcacttgacc      540
tgcccgcatc attggcgtaa tggcgaagaa ggcgaaaccg aagaacagtt tgtcgcgcgt      600
ctggcccgtg aactggaaga aaccattcag aaggaaggcg cggaaccat tgcgggcttt      660
tttgcggaac cggatgatggg tgctggcggg gttattccgc cggcgaaagg ctattttcag      720
gcgattctgc cgatcctgcg caaatatgat attccggtga tcagcgatga agtgatttgc      780
ggctttggcc gtaccggtaa cacctggggc tgcgtgacct atgattttac cccggatgcg      840
attattagca gtaaaaacct aaccgcgggt ttttttccgg taggcgcggg gattctgggt      900
ccggaactga gcaaactctt ggaaaccgcg attgaagcga tcggcagttt tccgcatggt      960
tttaccgcgg gcggccatcc ggtgggttgt gcgattgcgc tgaaagcgat tgatgtggtg     1020
atgaacgaag gcctggccga aaacgtgcgt cgtctggccc cgcgttttga agaactctg     1080
aaacatattg cggaacgtcc gaacattggc gaatatcgtg gcattggctt tatgtgggcg     1140
ctggaagcgg tgaaagataa agcgagcaaa gccccgtttg atggcaacct gagcgtgagc     1200
gaacgtattg cgaacacctg caccgatctg ggcctgattt gccgtccgac aggccagagc     1260
gtggttctgt gcccgcggtt tattctgacc gaagcgcaga tggatgaaat gttcgataaa     1320
ctggaaaaag cgctggataa agtgtttgcg gaagtggcg                                1359

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<210> 92
 <211> 453
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> Engineered variant of V. fluvialis transaminase
 <400> 92

Met Asn Lys Pro Gln Ser Trp Glu Thr Arg Ala Glu Thr Tyr Ser Leu
 1 5 10 15

Tyr Gly Phe Thr Asp Met Pro Ser Leu His Gln Arg Gly Thr Val Val
 20 25 30

Val Ala His Gly Glu Gly Pro Tyr Ile Val Asp Val His Gly Arg Arg
 35 40 45

Tyr Leu Asp Ala Asn Ser Gly Ala Leu Asn Met Val Ala Gly Phe Asp
 50 55 60

His Lys Gly Leu Ile Asp Ala Ala Lys Ala Gln Tyr Glu Arg Phe Pro
 65 70 75 80

Gly Tyr His Ala Phe Ser Gly His Met Ser Asp Gln Thr Val Met Leu
 85 90 95

CX2-126USP1_ST25

Ser Glu Lys Leu Val Glu Val Ser Pro Phe Asp Ser Gly Arg Val Phe
100 105 110

Tyr Thr Asn Ser Gly Ser Glu Ala Asn Asp Thr Met Val Lys Met Leu
115 120 125

Trp Phe Leu His Ala Ala Glu Gly Lys Pro Gln Lys Arg Lys Ile Leu
130 135 140

Thr Arg Trp Asn Ala Tyr His Gly Cys Thr Val Val Ser Ala Ser Met
145 150 155 160

Thr Gly Phe Pro Tyr Asn Ser Val Phe Gly Leu Pro Leu Pro Gly Phe
165 170 175

Leu His Leu Thr Cys Pro His Tyr Trp Arg Tyr Gly Glu Glu Gly Glu
180 185 190

Thr Glu Glu Gln Phe Val Ala Arg Leu Ala Arg Glu Leu Glu Glu Thr
195 200 205

Ile Gln Lys Glu Gly Ala Asp Thr Ile Ala Gly Phe Phe Ala Glu Pro
210 215 220

Val Met Gly Ala Gly Gly Val Ile Pro Pro Ala Lys Gly Tyr Phe Gln
225 230 235 240

Ala Ile Leu Pro Ile Leu Arg Lys Tyr Asp Ile Pro Val Ile Ser Asp
245 250 255

Glu Val Ile Cys Gly Phe Gly Arg Thr Gly Asn Thr Trp Gly Cys Val
260 265 270

Thr Tyr Asp Phe Thr Pro Asp Ala Ile Ile Ser Ser Lys Asn Leu Thr
275 280 285

Ala Gly Phe Phe Pro Val Gly Ala Val Ile Leu Gly Pro Glu Leu Ser
290 295 300

Lys Arg Leu Glu Thr Ala Ile Glu Ala Ile Gly Ser Phe Pro His Gly
305 310 315 320

Phe Thr Ala Gly Gly His Pro Val Gly Cys Ala Ile Ala Leu Lys Ala
325 330 335

Ile Asp Val Val Met Asn Glu Gly Leu Ala Glu Asn Val Arg Arg Leu
340 345 350

Ala Pro Arg Phe Glu Glu Arg Leu Lys His Ile Ala Glu Arg Pro Asn
355 360 365

CX2-126USP1_ST25

Ile Gly Glu Tyr Arg Gly Ile Gly Phe Met Trp Ala Leu Glu Ala Val
370 375 380

Lys Asp Lys Ala Ser Lys Ala Pro Phe Asp Gly Asn Leu Ser Val Ser
385 390 395 400

Glu Arg Ile Ala Asn Thr Cys Thr Asp Leu Gly Leu Ile Cys Arg Pro
405 410 415

Thr Gly Gln Ser Val Val Leu Cys Pro Pro Phe Ile Leu Thr Glu Ala
420 425 430

Gln Met Asp Glu Met Phe Asp Lys Leu Glu Lys Ala Leu Asp Lys Val
435 440 445

Phe Ala Glu Val Ala
450

<210> 93
<211> 1359
<212> DNA
<213> Artificial Sequence

<220>
<223> Engineered variant of V. fluvialis transaminase

<400> 93	
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atcgtggatg tgcattggcg tcgttatctg gatgcgaaca gcggcgcttt gaacatggtg	180
gcgggctttg atcataaagg cctgattgat gcggcgaaaag cgcagtatga acgttttccg	240
ggctatcatg cgttttcagg ccatatgagc gatcagaccg tgatgctgtc tgaaaaactg	300
gtggaagtga gcccgtttga tagcggccgt gtgttttata ccaacagcgg cagcgaagcg	360
aacgatacca tgggtgaaaat gctgtggttt ctgcatgcgg cggaaggcaa accgcagaaa	420
cgtaaaattc tgaccggtt gaacgcgtat catggctgta ccgtagtgag cgcgagcatg	480
accggctttc cgtataacag cgtgtttggc ctgccgctgc cgggctttct gcatctgacc	540
tgcccgcat attggcggtta tggcgaagaa ggcgaaaccg aagaacagtt tgtcgcgcgt	600
ctggcccgtg aactggaaga aaccattcag aaggaaaggc cgataccat tgcgggcttt	660
tttgcggaac cggatgatggg tgctggcggg gttattccgc cggcgaaagg ctattttcag	720
gcgattctgc cgatcctgcg caaatatgat attccggtga tcagcgatga agtgatttgc	780
ggctttggcc gtaccggtaa cacctggggc tgcgtgacct atgattttac cccggatgcg	840
attattagca gtaaaaacct aaccgcgggt ttttttccgg taggcgcggg gattctgggt	900
ccggaactga gcaaactgtt ggaaaccgcg attgaagcga tcggctgttt tccgcatggt	960
tttaccgcgg gcggccatcc ggtgggttgt gcgattgcgc tgaaagcgat tgatgtggtg	1020

CX2-126USP1_ST25

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gaacgtattg cgaacacctg caccgatctg ggcctgattt gccgtccgac aggccagagc 1260
gtggttctgt gcccgcggtt tattctgacc gaagcgcaga tggatgaaat gttcgataaa 1320
ctggaaaaag cgctggataa agtgtttgcg gaagtggcg 1359

<210> 94
<211> 453
<212> PRT
<213> Artificial sequence

<220>
<223> Engineered variant of v. fluvialis transaminase

<400> 94

Met Asn Lys Pro Gln Ser Trp Glu Thr Arg Ala Glu Thr Tyr Ser Leu
1 5 10 15

Tyr Gly Phe Thr Asp Met Pro Ser Leu His Gln Arg Gly Thr Val Val
20 25 30

Val Ala His Gly Glu Gly Pro Tyr Ile Val Asp Val His Gly Arg Arg
35 40 45

Tyr Leu Asp Ala Asn Ser Gly Ala Leu Asn Met Val Ala Gly Phe Asp
50 55 60

His Lys Gly Leu Ile Asp Ala Ala Lys Ala Gln Tyr Glu Arg Phe Pro
65 70 75 80

Gly Tyr His Ala Phe Ser Gly His Met Ser Asp Gln Thr Val Met Leu
85 90 95

Ser Glu Lys Leu Val Glu Val Ser Pro Phe Asp Ser Gly Arg Val Phe
100 105 110

Tyr Thr Asn Ser Gly Ser Glu Ala Asn Asp Thr Met Val Lys Met Leu
115 120 125

Trp Phe Leu His Ala Ala Glu Gly Lys Pro Gln Lys Arg Lys Ile Leu
130 135 140

Thr Arg Trp Asn Ala Tyr His Gly Cys Thr Val Val Ser Ala Ser Met
145 150 155 160

Thr Gly Phe Pro Tyr Asn Ser Val Phe Gly Leu Pro Leu Pro Gly Phe
165 170 175

Leu His Leu Thr Cys Pro His Tyr Trp Arg Tyr Gly Glu Glu Gly Glu
 180 185 190
 Thr Glu Glu Gln Phe Val Ala Arg Leu Ala Arg Glu Leu Glu Glu Thr
 195 200 205
 Ile Gln Lys Glu Gly Ala Asp Thr Ile Ala Gly Phe Phe Ala Glu Pro
 210 215 220
 Val Met Gly Ala Gly Gly Val Ile Pro Pro Ala Lys Gly Tyr Phe Gln
 225 230 235 240
 Ala Ile Leu Pro Ile Leu Arg Lys Tyr Asp Ile Pro Val Ile Ser Asp
 245 250 255
 Glu Val Ile Cys Gly Phe Gly Arg Thr Gly Asn Thr Trp Gly Cys Val
 260 265 270
 Thr Tyr Asp Phe Thr Pro Asp Ala Ile Ile Ser Ser Lys Asn Leu Thr
 275 280 285
 Ala Gly Phe Phe Pro Val Gly Ala Val Ile Leu Gly Pro Glu Leu Ser
 290 295 300
 Lys Arg Leu Glu Thr Ala Ile Glu Ala Ile Gly Cys Phe Pro His Gly
 305 310 315 320
 Phe Thr Ala Gly Gly His Pro Val Gly Cys Ala Ile Ala Leu Lys Ala
 325 330 335
 Ile Asp Val Val Met Asn Glu Gly Leu Ala Glu Asn Val Arg Arg Leu
 340 345 350
 Ala Pro Arg Phe Glu Glu Arg Leu Lys His Ile Ala Glu Arg Pro Asn
 355 360 365
 Ile Gly Glu Tyr Arg Gly Ile Gly Phe Met Trp Ala Leu Glu Ala Val
 370 375 380
 Lys Asp Lys Ala Ser Lys Ala Pro Phe Asp Gly Asn Leu Ser Val Ser
 385 390 395 400
 Glu Arg Ile Ala Asn Thr Cys Thr Asp Leu Gly Leu Ile Cys Arg Pro
 405 410 415
 Thr Gly Gln Ser Val Val Leu Cys Pro Pro Phe Ile Leu Thr Glu Ala
 420 425 430
 Gln Met Asp Glu Met Phe Asp Lys Leu Glu Lys Ala Leu Asp Lys Val
 435 440 445

Phe Ala Glu Val Ala
450

<210> 95
<211> 1359
<212> DNA
<213> Artificial Sequence

<220>
<223> Engineered variant of *V. fluvialis* transaminase

<400> 95
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atcgtggatg tgcattggccg tcgttatctg gatgcgaaca gcggcgcttt gaacatggtg 180
gcgggctttg atcataaagg cctgattgat gcggcgaaag cgcagtatga acgttttccg 240
ggctatcatg cgttttccagg ccatatgagc gatcagaccg tgatgctgtc tgaaaaactg 300
gtggaagtga gcccgtttga tagcggccgt gtgttttata ccaacagcgg cagcgaagcg 360
aacgatacca tgggtgaaaat gctgtggttt ctgcatgcgg cggaaggcaa accgcagaaa 420
cgtaaaattc tgaccgcttg gaacgcgtat catggctgta ccgtagtgag cgcgagcatg 480
accggctttc cgtataacag cgtgtttggc ctgccgctgc cgggctttct gcattctgacc 540
tgcccgcatt attggcggtt tggcgaagaa ggcgaaaccg aagaacagtt tgcgcgcgt 600
ctggcccgtg aactggaaga aaccattcag aagggaaggc cgataccat tgcgggcttt 660
tttgcggaac cggatgatggg tgctggcggg gttattccgc cggcgaaaagg ctattttcag 720
gcgattctgc cgatcctgcg caaatatgat attccgggtg tcagcgatga agtgatttgc 780
ggctttggcc gtaccggtta cacctggggc tgcgtgacct atgattttac cccggatgcg 840
attattagca gtaaaaacct aaccgcgggt ttttttccgg taggcgcggg gattctgggt 900
ccggaactga gcaaacgtct ggaaaccgcg attgaagcga tcggcgaatt tccgcatggt 960
tttaccgcgg gcggccatcc ggtgggttgt gcgattgcgc tgaaagcgat tgatgtggtg 1020
atgaacgaag gcctggccga aaacgtgcgt cgtctggccc cgcgttttga agaacgtctg 1080
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gaacgtattg cgaacacctg caccgatctg ggcctgattt gccgtccgac aggccagagc 1260
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ctggaaaaag cgctggataa agtggttgcg gaagtggcg 1359

<210> 96
<211> 453
<212> PRT
<213> Artificial Sequence

<220>
<223> Engineered variant of *V. fluvialis* transaminase

<400> 96

Met Asn Lys Pro Gln Ser Trp Glu Thr Arg Ala Glu Thr Tyr Ser Leu
 1 5 10 15
 Tyr Gly Phe Thr Asp Met Pro Ser Leu His Gln Arg Gly Thr Val Val
 20 25 30
 Val Ala His Gly Glu Gly Pro Tyr Ile Val Asp Val His Gly Arg Arg
 35 40 45
 Tyr Leu Asp Ala Asn Ser Gly Ala Leu Asn Met Val Ala Gly Phe Asp
 50 55 60
 His Lys Gly Leu Ile Asp Ala Ala Lys Ala Gln Tyr Glu Arg Phe Pro
 65 70 75 80
 Gly Tyr His Ala Phe Ser Gly His Met Ser Asp Gln Thr Val Met Leu
 85 90 95
 Ser Glu Lys Leu Val Glu Val Ser Pro Phe Asp Ser Gly Arg Val Phe
 100 105 110
 Tyr Thr Asn Ser Gly Ser Glu Ala Asn Asp Thr Met Val Lys Met Leu
 115 120 125
 Trp Phe Leu His Ala Ala Glu Gly Lys Pro Gln Lys Arg Lys Ile Leu
 130 135 140
 Thr Arg Trp Asn Ala Tyr His Gly Cys Thr Val Val Ser Ala Ser Met
 145 150 155 160
 Thr Gly Phe Pro Tyr Asn Ser Val Phe Gly Leu Pro Leu Pro Gly Phe
 165 170 175
 Leu His Leu Thr Cys Pro His Tyr Trp Arg Tyr Gly Glu Glu Gly Glu
 180 185 190
 Thr Glu Glu Gln Phe Val Ala Arg Leu Ala Arg Glu Leu Glu Glu Thr
 195 200 205
 Ile Gln Lys Glu Gly Ala Asp Thr Ile Ala Gly Phe Phe Ala Glu Pro
 210 215 220
 Val Met Gly Ala Gly Gly Val Ile Pro Pro Ala Lys Gly Tyr Phe Gln
 225 230 235 240
 Ala Ile Leu Pro Ile Leu Arg Lys Tyr Asp Ile Pro Val Ile Ser Asp
 245 250 255
 Glu Val Ile Cys Gly Phe Gly Arg Thr Gly Asn Thr Trp Gly Cys Val
 260 265 270

CX2-126USP1_ST25

Thr Tyr Asp Phe Thr Pro Asp Ala Ile Ile Ser Ser Lys Asn Leu Thr
275 280 285

Ala Gly Phe Phe Pro Val Gly Ala Val Ile Leu Gly Pro Glu Leu Ser
290 295 300

Lys Arg Leu Glu Thr Ala Ile Glu Ala Ile Gly Glu Phe Pro His Gly
305 310 315 320

Phe Thr Ala Gly Gly His Pro Val Gly Cys Ala Ile Ala Leu Lys Ala
325 330 335

Ile Asp Val Val Met Asn Glu Gly Leu Ala Glu Asn Val Arg Arg Leu
340 345 350

Ala Pro Arg Phe Glu Glu Arg Leu Lys His Ile Ala Glu Arg Pro Asn
355 360 365

Ile Gly Glu Tyr Arg Gly Ile Gly Phe Met Trp Ala Leu Glu Ala Val
370 375 380

Lys Asp Lys Ala Ser Lys Ala Pro Phe Asp Pro Asn Leu Ser Val Ser
385 390 395 400

Glu Arg Ile Ala Asn Thr Cys Thr Asp Leu Gly Leu Ile Cys Arg Pro
405 410 415

Thr Gly Gln Ser Val Val Leu Cys Pro Pro Phe Ile Leu Thr Glu Ala
420 425 430

Gln Met Asp Glu Met Phe Asp Lys Leu Glu Lys Ala Leu Asp Lys Val
435 440 445

Phe Ala Glu Val Ala
450

<210> 97
<211> 1359
<212> DNA
<213> Artificial Sequence

<220>
<223> Engineered variant of V. fluvialis transaminase

<400> 97	
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atcgtggatg tgcattggccg tcgttatctg gatgcgaaca gcggcgcttt gaacatggtg	180
gcgggctttg atcataaagg cctgattgat gcggcgaaag cgcagtatga acgttttccg	240
ggctatcatg cgttttcagg ccatatgagc gatcagaccg tgatgctgtc tgaaaaactg	300

CX2-126USP1_ST25

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cgtaaaattc tgaccggttg gaacgcgtat catggctgta ccgtagtgag cgcgagcatg 480
accggctttc cgtataacag cgtgtttggc ctgccgctgc cgggctttct gcatctgacc 540
tgcccgcatt attggcggtta tggcgaagaa ggcgaaaccg aagaacagtt tgtcgcgcgt 600
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tttgcggaac cgggtgatggg tgctggcggg gttattccgc cggcgaaagg ctattttcag 720
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gaacgtattg cgaacacctg caccgatctg ggcctgattt gccgtccgac aggccagagc 1260
gtggttctgt gcccgcggtt tattctgacc gaagcgcaga tggatgaaat gttcgataaa 1320
ctggaaaaag cgctggataa agtgtttgcg gaagtggcg 1359

<210> 98

<211> 453

<212> PRT

<213> Artificial Sequence

<220>

<223> Engineered variant of V. fluvialis transaminase

<400> 98

Met Asn Lys Pro Gln Ser Trp Glu Thr Arg Ala Glu Thr Tyr Ser Leu
1 5 10 15

Tyr Gly Phe Thr Asp Met Pro Ser Leu His Gln Arg Gly Thr Val Val
20 25 30

Val Ala His Gly Glu Gly Pro Tyr Ile Val Asp Val His Gly Arg Arg
35 40 45

Tyr Leu Asp Ala Asn Ser Gly Ala Leu Asn Met Val Ala Gly Phe Asp
50 55 60

His Lys Gly Leu Ile Asp Ala Ala Lys Ala Gln Tyr Glu Arg Phe Pro
65 70 75 80

CX2-126USP1_ST25

Gly Tyr His Ala Phe Ser Gly His Met Ser Asp Gln Thr Val Met Leu
85 90 95

Ser Glu Lys Leu Val Glu Val Ser Pro Phe Asp Ser Gly Arg Val Phe
100 105 110

Tyr Thr Asn Ser Gly Ser Glu Ala Asn Asp Thr Met Val Lys Met Leu
115 120 125

Trp Phe Leu His Ala Ala Glu Gly Lys Pro Gln Lys Arg Lys Ile Leu
130 135 140

Thr Arg Trp Asn Ala Tyr His Gly Cys Thr Val Val Ser Ala Ser Met
145 150 155 160

Thr Gly Phe Pro Tyr Asn Ser Val Phe Gly Leu Pro Leu Pro Gly Phe
165 170 175

Leu His Leu Thr Cys Pro His Tyr Trp Arg Tyr Gly Glu Glu Gly Glu
180 185 190

Thr Glu Glu Gln Phe Val Ala Arg Leu Ala Arg Glu Leu Glu Glu Thr
195 200 205

Ile Gln Lys Glu Gly Ala Asp Thr Ile Ala Gly Phe Phe Ala Glu Pro
210 215 220

Val Met Gly Ala Gly Gly Val Ile Pro Pro Ala Lys Gly Tyr Phe Gln
225 230 235 240

Ala Ile Leu Pro Ile Leu Arg Lys Tyr Asp Ile Pro Val Ile Ser Asp
245 250 255

Glu Val Ile Cys Gly Phe Gly Arg Thr Gly Asn Thr Trp Gly Cys Val
260 265 270

Thr Tyr Asp Phe Thr Pro Asp Ala Ile Ile Ser Ser Lys Asn Leu Thr
275 280 285

Ala Gly Phe Phe Pro Val Gly Ala Val Ile Leu Gly Pro Glu Leu Ser
290 295 300

Lys Arg Leu Glu Thr Ala Ile Glu Ala Ile Gly Thr Phe Pro His Gly
305 310 315 320

Phe Thr Ala Gly Gly His Pro Val Gly Cys Ala Ile Ala Leu Lys Ala
325 330 335

Ile Asp Val Val Met Asn Glu Gly Leu Ala Glu Asn Val Arg Arg Leu
340 345 350

CX2-126USP1_ST25

Ala Pro Arg Phe Glu Glu Arg Leu Lys His Ile Ala Glu Arg Pro Asn
355 360 365

Ile Gly Glu Tyr Arg Gly Ile Gly Phe Met Trp Ala Leu Glu Ala Val
370 375 380

Lys Asp Lys Ala Ser Lys Ala Pro Phe Asp Gly Asn Leu Ser Val Ser
385 390 395 400

Glu Arg Ile Ala Asn Thr Cys Thr Asp Leu Gly Leu Ile Cys Arg Pro
405 410 415

Thr Gly Gln Ser Val Val Leu Cys Pro Pro Phe Ile Leu Thr Glu Ala
420 425 430

Gln Met Asp Glu Met Phe Asp Lys Leu Glu Lys Ala Leu Asp Lys Val
435 440 445

Phe Ala Glu Val Ala
450

<210> 99
<211> 1359
<212> DNA
<213> Artificial Sequence

<220>
<223> Engineered variant of V. fluvialis transaminase

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gcgggctttg atcataaagg cctgattgat gcggcgaaag cgcagtatga acgttttccg 240
ggctatcatg cgttttcagg ccatatgagc gatcagaccg tgatgctgtc tgaaaaactg 300
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cgtaaaattc tgaccggtg gaacgcgtat catggctgta ccgtagtgag cgcgagcatg 480
accggctttc cgtataacag cgtgtttggc ctgccgctgc cgggctttct gcatctgacc 540
tgcccgcatc attggcggtt tggcgaagaa ggcgaaaccg aagaacagtt tgtcgcgcgt 600
ctggcccgtg aactggaaga aaccattcag aagggaaggcg cggaaccat tcggggcttt 660
tttgcggaac cgggtgatgg tgctggcggg gttattccgc cggcgaaagg ctattttcag 720
gcgattctgc cgatcctgcg caaatatgat attccgggtga tcagcgatga agtgatttgc 780
ggctttggcc gtaccggtaa cacctggggc tgcgtgacct atgattttac cccggatgcg 840
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CX2-126USP1_ST25

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aaacatattg cggaacgtcc gaacattggc gaatatcgtg gcattggctt tatgtgggcg 1140
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ctggaaaaag cgctggataa agtgtttgcg gaagtggcg 1359

<210> 100

<211> 453

<212> PRT

<213> Artificial Sequence

<220>

<223> Engineered variant of V. fluvialis transaminase

<400> 100

Met Asn Lys Pro Gln Ser Trp Glu Thr Arg Ala Glu Thr Tyr Ser Leu
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Tyr Gly Phe Thr Asp Met Pro Ser Leu His Gln Arg Gly Thr Val Val
20 25 30

Val Ala His Gly Glu Gly Pro Tyr Ile Val Asp Val His Gly Arg Arg
35 40 45

Tyr Leu Asp Ala Asn Ser Gly Ala Leu Asn Met Val Ala Gly Phe Asp
50 55 60

His Lys Gly Leu Ile Asp Ala Ala Lys Ala Gln Tyr Glu Arg Phe Pro
65 70 75 80

Gly Tyr His Ala Phe Ser Gly His Met Ser Asp Gln Thr Val Met Leu
85 90 95

Ser Glu Lys Leu Val Glu Val Ser Pro Phe Asp Ser Gly Arg Val Phe
100 105 110

Tyr Thr Asn Ser Gly Ser Glu Ala Asn Asp Thr Met Val Lys Met Leu
115 120 125

Trp Phe Leu His Ala Ala Glu Gly Lys Pro Gln Lys Arg Lys Ile Leu
130 135 140

Thr Arg Trp Asn Ala Tyr His Gly Cys Thr Val Val Ser Ala Ser Met
145 150 155 160

Thr Gly Phe Pro Tyr Asn Ser Val Phe Gly Leu Pro Leu Pro Gly Phe
165 170 175

CX2-126USP1_ST25

Leu His Leu Thr Cys Pro His Tyr Trp Arg Tyr Gly Glu Glu Gly Glu
 180 185 190
 Thr Glu Glu Gln Phe Val Ala Arg Leu Ala Arg Glu Leu Glu Glu Thr
 195 200 205
 Ile Gln Lys Glu Gly Ala Asp Thr Ile Ala Gly Phe Phe Ala Glu Pro
 210 215 220
 Val Met Gly Ala Gly Gly Val Ile Pro Pro Ala Lys Gly Tyr Phe Gln
 225 230 235 240
 Ala Ile Leu Pro Ile Leu Arg Lys Tyr Asp Ile Pro Val Ile Ser Asp
 245 250 255
 Glu Val Ile Cys Gly Phe Gly Arg Thr Gly Asn Thr Trp Gly Cys Val
 260 265 270
 Thr Tyr Asp Phe Thr Pro Asp Ala Ile Ile Ser Ser Lys Asn Leu Thr
 275 280 285
 Ala Gly Phe Phe Pro Val Gly Ala Val Ile Leu Gly Pro Glu Leu Ser
 290 295 300
 Lys Arg Leu Glu Thr Ala Ile Glu Ala Ile Gly Asn Phe Pro His Gly
 305 310 315 320
 Phe Thr Ala Gly Gly His Pro Val Gly Cys Ala Ile Ala Leu Lys Ala
 325 330 335
 Ile Asp Val Val Met Asn Glu Gly Leu Ala Glu Asn Val Arg Arg Leu
 340 345 350
 Ala Pro Arg Phe Glu Glu Arg Leu Lys His Ile Ala Glu Arg Pro Asn
 355 360 365
 Ile Gly Glu Tyr Arg Gly Ile Gly Phe Met Trp Ala Leu Glu Ala Val
 370 375 380
 Lys Asp Lys Ala Ser Lys Ala Pro Phe Asp Gly Asn Leu Ser Val Ser
 385 390 395 400
 Glu Arg Ile Ala Asn Thr Cys Thr Asp Leu Gly Leu Ile Cys Arg Pro
 405 410 415
 Thr Gly Gln Ser Val Val Leu Cys Pro Pro Phe Ile Leu Thr Glu Ala
 420 425 430
 Gln Met Asp Glu Met Phe Asp Lys Leu Glu Lys Ala Leu Asp Lys Val
 435 440 445

Phe Ala Glu Val Ala
450

<210> 101
<211> 1359
<212> DNA
<213> Artificial Sequence

<220>
<223> Engineered variant of *V. fluvialis* transaminase

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atcgtggatg tgcattggcg tcgttatctg gatgcgaaca gcggcgcttt gaacatggtg      180
gcgggctttg atcataaagg cctgattgat gcggcgaaaag cgcagtatga acgttttccg      240
ggctatcatg cgttttcagg ccatatgagc gatcagaccg tgatgctgtc tgaaaaactg      300
gtggaagtga gcccgtttga tagcggccgt gtgttttata ccaacagcgg cagcgaagcg      360
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accggctttc cgtataacag cgtgtttggc ctgccgctgc cgggctttct gcatctgacc      540
tgcccgcatc attggcgcta tggcgaagaa ggcgaaaccg aagaacagtt tgtcgcgcgt      600
ctggcccgtg aactggaaga aaccattcag aagggaaggcg cggataccat tgcgggcttt      660
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ggctttggcc gtaccggtaa cacctggggc tgcgtgacct atgattttac cccggatgcg      840
attattagca gtaaaaacct aaccgcgggt ttttttccgg taggcgcggg gattctgggt      900
ccggaactga gcaaacgtct ggaaaccgcg attgaagcga tcggcttttt tccgcatggt      960
tttaccgcgg gcggccatcc ggtgggttgt gcgattgcgc tgaaagcgat tgatgtggtg     1020
atgaacgaag gcctggccga aaacgtgcgt cgtctggccc cgcgttttga agaacgtctg     1080
aaacatattg cggaaacgtc gaacattggc gaatatctg gcattggctt tatgtgggcg     1140
ctggaagcgg tgaaagataa agcgagcaaa gccccgtttg atggcaacct gagcgtgagc     1200
gaacgtattg cgaacacctg caccgatctg ggcctgattt gccgtccgac aggccagagc     1260
gtggttctgt gcccgcggtt tattctgacc gaagcgcaga tggatgaaat gttcgataaa     1320
ctggaaaaag cgctggataa agtggttgcg gaagtggcg                                1359

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<210> 102
<211> 453
<212> PRT
<213> Artificial Sequence

<220>

<223> Engineered variant of *V. fluvialis* transaminase

<400> 102

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Met Asn Lys Pro Gln Ser Trp Glu Thr Arg Ala Glu Thr Tyr Ser Leu
1      5      10      15

Tyr Gly Phe Thr Asp Met Pro Ser Leu His Gln Arg Gly Thr Val Val
      20      25      30

Val Ala His Gly Glu Gly Pro Tyr Ile Val Asp Val His Gly Arg Arg
      35      40      45

Tyr Leu Asp Ala Asn Ser Gly Ala Leu Asn Met Val Ala Gly Phe Asp
50      55      60

His Lys Gly Leu Ile Asp Ala Ala Lys Ala Gln Tyr Glu Arg Phe Pro
65      70      75      80

Gly Tyr His Ala Phe Ser Gly His Met Ser Asp Gln Thr Val Met Leu
      85      90      95

Ser Glu Lys Leu Val Glu Val Ser Pro Phe Asp Ser Gly Arg Val Phe
100     105     110

Tyr Thr Asn Ser Gly Ser Glu Ala Asn Asp Thr Met Val Lys Met Leu
115     120     125

Trp Phe Leu His Ala Ala Glu Gly Lys Pro Gln Lys Arg Lys Ile Leu
130     135     140

Thr Arg Trp Asn Ala Tyr His Gly Cys Thr Val Val Ser Ala Ser Met
145     150     155     160

Thr Gly Phe Pro Tyr Asn Ser Val Phe Gly Leu Pro Leu Pro Gly Phe
165     170     175

Leu His Leu Thr Cys Pro His Tyr Trp Arg Tyr Gly Glu Glu Gly Glu
180     185     190

Thr Glu Glu Gln Phe Val Ala Arg Leu Ala Arg Glu Leu Glu Glu Thr
195     200     205

Ile Gln Lys Glu Gly Ala Asp Thr Ile Ala Gly Phe Phe Ala Glu Pro
210     215     220

Val Met Gly Ala Gly Gly Val Ile Pro Pro Ala Lys Gly Tyr Phe Gln
225     230     235     240

Ala Ile Leu Pro Ile Leu Arg Lys Tyr Asp Ile Pro Val Ile Ser Asp
245     250     255

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CX2-126USP1_ST25

Glu Val Ile Cys Gly Phe Gly Arg Thr Gly Asn Thr Trp Gly Cys Val
260 265 270

Thr Tyr Asp Phe Thr Pro Asp Ala Ile Ile Ser Ser Lys Asn Leu Thr
275 280 285

Ala Gly Phe Phe Pro Val Gly Ala Val Ile Leu Gly Pro Glu Leu Ser
290 295 300

Lys Arg Leu Glu Thr Ala Ile Glu Ala Ile Gly Phe Phe Pro His Gly
305 310 315 320

Phe Thr Ala Gly Gly His Pro Val Gly Cys Ala Ile Ala Leu Lys Ala
325 330 335

Ile Asp Val Val Met Asn Glu Gly Leu Ala Glu Asn Val Arg Arg Leu
340 345 350

Ala Pro Arg Phe Glu Glu Arg Leu Lys His Ile Ala Glu Arg Pro Asn
355 360 365

Ile Gly Glu Tyr Arg Gly Ile Gly Phe Met Trp Ala Leu Glu Ala Val
370 375 380

Lys Asp Lys Ala Ser Lys Ala Pro Phe Asp Gly Asn Leu Ser Val Ser
385 390 395 400

Glu Arg Ile Ala Asn Thr Cys Thr Asp Leu Gly Leu Ile Cys Arg Pro
405 410 415

Thr Gly Gln Ser Val Val Leu Cys Pro Pro Phe Ile Leu Thr Glu Ala
420 425 430

Gln Met Asp Glu Met Phe Asp Lys Leu Glu Lys Ala Leu Asp Lys Val
435 440 445

Phe Ala Glu Val Ala
450

- <210> 103
- <211> 1359
- <212> DNA
- <213> Artificial Sequence

- <220>
- <223> Engineered variant of v. fluvialis transaminase

<400> 103
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atcgtggatg tgcattggccg tcgttatctg gatgcgaaca gcggcgcttt gaacatggtg 180
gcgggctttg atcataaagg cctgattgat gcggcgaaag cgcagtatga acgtttttccg 240

CX2-126USP1_ST25

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ggctatcatg cgttttcagg ccatatgagc gatcagaccg tgatgctgtc tgaaaaactg      300
gtggaagtga gcccgtttga tagcggccgt gtgttttata ccaacagcgg cagcgaagcg      360
aacgatacca tgggtgaaaat gctgtggttt ctgcatgcgg cggaaggcaa accgcagaaa      420
cgtaaaattc tgacccgttg gaacgcgtat catggctgta ccgtagtgag cgcgagcatg      480
accggctttc cgtataacag cgtgtttggc ctgccgctgc cgggctttct gcatctgacc      540
tgcccgcatt attggcggtta tggcgaagaa ggcgaaaccg aagaacagtt tgtcgcgcgt      600
ctggcccgtg aactggaaga aaccattcag aaggaaggcg cggataccat tgcgggcttt      660
tttgcggaac cgggtgatggg tgctggcggg gttattccgc cggcgaaagg ctattttcag      720
gcgattctgc cgatcctgcg caaatatgat attccgggtga tcagcgatga agtgatttgc      780
ggctttggcc gtaccggtaa cacctggggc tgcgtgacct atgattttac cccggatgcg      840
attattagca gtaaattgtc aaccgcgggt ttttttccgg taggcgcggg gattctgggt      900
ccggaactga gcaaactgtc ggaaaccgcg attgaagcga tcggcgaatt tccgcatggt      960
tttaccgcgg gcggccatcc ggtgggttgt gcgattgcgc tgaaagcgat tgatgtggtg     1020
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aaacatatgg cggaacgtcc gaacattggc gaatatcgtg gcattggctt tatgtgggcg     1140
ctggaagcgg tgaaagataa agcgagcaaa gccccgtttg atggcaacct gagcgtgagc     1200
gaacgtattg cgaacacctg caccgatctg ggcttgattt gccgtccgac aggccagagc     1260
gtggttctgt gcccgcggtt tattctgacc gaagcgcaga tggatgaaat gttcgataaa     1320
ctggaaaaag cgctggataa agtgtttgcg gaagtggcg                                1359

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<210> 104
 <211> 453
 <212> PRT
 <213> Artificial sequence

<220>
 <223> Engineered variant of v. fluvialis transaminase
 <400> 104

Met Asn Lys Pro Gln Ser Trp Glu Thr Arg Ala Glu Thr Tyr Ser Leu
 1 5 10 15

Tyr Gly Phe Thr Asp Met Pro Ser Leu His Gln Arg Gly Thr Val Val
 20 25 30

Val Ala His Gly Glu Gly Pro Tyr Ile Val Asp Val His Gly Arg Arg
 35 40 45

Tyr Leu Asp Ala Asn Ser Gly Ala Leu Asn Met Val Ala Gly Phe Asp
 50 55 60

His Lys Gly Leu Ile Asp Ala Ala Lys Ala Gln Tyr Glu Arg Phe Pro
 65 70 75 80

CX2-126USP1_ST25

Gly Tyr His Ala Phe Ser Gly His Met Ser Asp Gln Thr Val Met Leu
 85 90 95
 Ser Glu Lys Leu Val Glu Val Ser Pro Phe Asp Ser Gly Arg Val Phe
 100 105 110
 Tyr Thr Asn Ser Gly Ser Glu Ala Asn Asp Thr Met Val Lys Met Leu
 115 120 125
 Trp Phe Leu His Ala Ala Glu Gly Lys Pro Gln Lys Arg Lys Ile Leu
 130 135 140
 Thr Arg Trp Asn Ala Tyr His Gly Cys Thr Val Val Ser Ala Ser Met
 145 150 155 160
 Thr Gly Phe Pro Tyr Asn Ser Val Phe Gly Leu Pro Leu Pro Gly Phe
 165 170 175
 Leu His Leu Thr Cys Pro His Tyr Trp Arg Tyr Gly Glu Glu Gly Glu
 180 185 190
 Thr Glu Glu Gln Phe Val Ala Arg Leu Ala Arg Glu Leu Glu Glu Thr
 195 200 205
 Ile Gln Lys Glu Gly Ala Asp Thr Ile Ala Gly Phe Phe Ala Glu Pro
 210 215 220
 Val Met Gly Ala Gly Gly Val Ile Pro Pro Ala Lys Gly Tyr Phe Gln
 225 230 235 240
 Ala Ile Leu Pro Ile Leu Arg Lys Tyr Asp Ile Pro Val Ile Ser Asp
 245 250 255
 Glu Val Ile Cys Gly Phe Gly Arg Thr Gly Asn Thr Trp Gly Cys Val
 260 265 270
 Thr Tyr Asp Phe Thr Pro Asp Ala Ile Ile Ser Ser Lys Cys Leu Thr
 275 280 285
 Ala Gly Phe Phe Pro Val Gly Ala Val Ile Leu Gly Pro Glu Leu Ser
 290 295 300
 Lys Arg Leu Glu Thr Ala Ile Glu Ala Ile Gly Glu Phe Pro His Gly
 305 310 315 320
 Phe Thr Ala Gly Gly His Pro Val Gly Cys Ala Ile Ala Leu Lys Ala
 325 330 335
 Ile Asp Val Val Met Asn Glu Gly Leu Ala Glu Asn Val Arg Arg Leu
 340 345 350

CX2-126USP1_ST25

Ala Pro Arg Phe Glu Glu Arg Leu Lys His Ile Ala Glu Arg Pro Asn
355 360 365

Ile Gly Glu Tyr Arg Gly Ile Gly Phe Met Trp Ala Leu Glu Ala Val
370 375 380

Lys Asp Lys Ala Ser Lys Ala Pro Phe Asp Gly Asn Leu Ser Val Ser
385 390 395 400

Glu Arg Ile Ala Asn Thr Cys Thr Asp Leu Gly Leu Ile Cys Arg Pro
405 410 415

Thr Gly Gln Ser Val Val Leu Cys Pro Pro Phe Ile Leu Thr Glu Ala
420 425 430

Gln Met Asp Glu Met Phe Asp Lys Leu Glu Lys Ala Leu Asp Lys Val
435 440 445

Phe Ala Glu Val Ala
450

<210> 105
<211> 1359
<212> DNA
<213> Artificial Sequence

<220>
<223> Engineered variant of V. fluvialis transaminase

<400> 105
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atcgtggatg tgcattggcg tcgttatctg gatgcgaaca gcggcgcttt gaacatggtg 180
gcgggctttg atcataaagg cctgattgat gcggcgaaag cgcagtatga acgttttccg 240
ggctatcatg cgttttcagg ccatatgagc gatcagaccg tgatgctgtc tgaaaaactg 300
gtggaagtga gcccgtttgg tagcggccgt gtgttttata ccaacagcgg cagcgaagcg 360
aacgatacca tgggtgaaaat gctgtggttt ctgcatgcgg cggaaggcaa accgcagaaa 420
cgtaaaattc tgaccggtt gaacgcgtat catggctgta ccgtagtgag cgcgagcatg 480
accggctttc cgtataacag cgtgtttggc ctgccgctgc cgggctttct gcatctgacc 540
tgcccgcat attggcggtt tggcgaagaa ggcgaaaccg aagaacagtt tgtcgcgcgt 600
ctggcccgtg aactggaaga aaccattcag aagggaaggcg cggataccat tgcgggcttt 660
tttgcggaac cgggtgatggg tgctggcggg gttattccgc cggcgaaagg ctattttcag 720
gcgattctgc cgtacctgcg caaatatgat attccgggtga tcagcgatga agtgatttgc 780
ggctttggcc gtaccggtaa cacctggggc tgcgtgacct atgattttac cccggatgcg 840
attattagca gtaaaaacct aaccgcgggt ttttttccgg taggcgcggg gattctgggt 900

CX2-126USP1_ST25

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 atgaacgaag gcctggccga aaacgtgcgt cgtctggccc cgcgttttga agaacgtctg 1080
 aaacatattg cggaacgtcc gaacattggc gaatatcgtg gcattggctt tatgtgggcg 1140
 ctggaagcgg tgaaagataa agcgagcaaa gccccgtttg atggcaacct gagcgtgagc 1200
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 gtggttctgt gcccgccgtt tattctgacc gaagcgcaga tggatgaaat gttcgataaa 1320
 ctggaaaaag cgctggataa agtgtttgcg gaagtggcg 1359

<210> 106

<211> 453

<212> PRT

<213> Artificial Sequence

<220>

<223> Engineered variant of V. fluvialis transaminase

<400> 106

Met Asn Lys Pro Gln Ser Trp Glu Thr Arg Ala Glu Thr Tyr Ser Leu
 1 5 10 15

Tyr Gly Phe Thr Asp Met Pro Ser Leu His Gln Arg Gly Thr Val Val
 20 25 30

Val Ala His Gly Glu Gly Pro Tyr Ile Val Asp Val His Gly Arg Arg
 35 40 45

Tyr Leu Asp Ala Asn Ser Gly Ala Leu Asn Met Val Ala Gly Phe Asp
 50 55 60

His Lys Gly Leu Ile Asp Ala Ala Lys Ala Gln Tyr Glu Arg Phe Pro
 65 70 75 80

Gly Tyr His Ala Phe Ser Gly His Met Ser Asp Gln Thr Val Met Leu
 85 90 95

Ser Glu Lys Leu Val Glu Val Ser Pro Phe Gly Ser Gly Arg Val Phe
 100 105 110

Tyr Thr Asn Ser Gly Ser Glu Ala Asn Asp Thr Met Val Lys Met Leu
 115 120 125

Trp Phe Leu His Ala Ala Glu Gly Lys Pro Gln Lys Arg Lys Ile Leu
 130 135 140

Thr Arg Trp Asn Ala Tyr His Gly Cys Thr Val Val Ser Ala Ser Met
 145 150 155 160

Thr Gly Phe Pro Tyr Asn Ser Val Phe Gly Leu Pro Leu Pro Gly Phe
 165 170 175
 Leu His Leu Thr Cys Pro His Tyr Trp Arg Tyr Gly Glu Glu Gly Glu
 180 185 190
 Thr Glu Glu Gln Phe Val Ala Arg Leu Ala Arg Glu Leu Glu Glu Thr
 195 200 205
 Ile Gln Lys Glu Gly Ala Asp Thr Ile Ala Gly Phe Phe Ala Glu Pro
 210 215 220
 Val Met Gly Ala Gly Gly Val Ile Pro Pro Ala Lys Gly Tyr Phe Gln
 225 230 235 240
 Ala Ile Leu Pro Ile Leu Arg Lys Tyr Asp Ile Pro Val Ile Ser Asp
 245 250 255
 Glu Val Ile Cys Gly Phe Gly Arg Thr Gly Asn Thr Trp Gly Cys Val
 260 265 270
 Thr Tyr Asp Phe Thr Pro Asp Ala Ile Ile Ser Ser Lys Asn Leu Thr
 275 280 285
 Ala Gly Phe Phe Pro Val Gly Ala Val Ile Leu Gly Pro Glu Leu Ser
 290 295 300
 Lys Arg Leu Glu Thr Ala Ile Glu Ala Ile Gly Glu Phe Pro His Gly
 305 310 315 320
 Phe Thr Ala Gly Gly His Pro Val Gly Cys Ala Ile Ala Leu Lys Ala
 325 330 335
 Ile Asp Val Val Met Asn Glu Gly Leu Ala Glu Asn Val Arg Arg Leu
 340 345 350
 Ala Pro Arg Phe Glu Glu Arg Leu Lys His Ile Ala Glu Arg Pro Asn
 355 360 365
 Ile Gly Glu Tyr Arg Gly Ile Gly Phe Met Trp Ala Leu Glu Ala Val
 370 375 380
 Lys Asp Lys Ala Ser Lys Ala Pro Phe Asp Gly Asn Leu Ser Val Ser
 385 390 395 400
 Glu Arg Ile Ala Asn Thr Cys Thr Asp Leu Gly Leu Ile Cys Arg Pro
 405 410 415
 Thr Gly Gln Ser Val Val Leu Cys Pro Pro Phe Ile Leu Thr Glu Ala
 420 425 430

CX2-126USP1_ST25

Gln Met Asp Glu Met Phe Asp Lys Leu Glu Lys Ala Leu Asp Lys Val
 435 440 445

Phe Ala Glu Val Ala
 450

<210> 107
 <211> 1359
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Engineered variant of *V. fluvialis* transaminase

<400> 107
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 gcgggctttg atcataaagg cctgattgat gcggcgaaaag cgcagtatga acgttttccg 240
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 gtggaagtga gcccgtttga tagcggccgt gtgtttccta ccaacagcgg cagcgaagcg 360
 aacgatacca tgggtgaaaat gctgtggttt ctgcatgcgg cggaaggcaa accgcagaaa 420
 cgtaaaattc tgacccgttg gaacgcgtat catggctgta ccgtagtgag cgcgagcatg 480
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 ctggcccgtg aactggaaga aaccattcag aaggaaaggc cgataccat tgcgggcttt 660
 tttgcggaac cgggtgatggg tgctggcggg gttattccgc cggcgaaagg ctattttcag 720
 gcgattctgc cgatcctgcg caaatatgat attccggtga tcagcgatga agtgatttgc 780
 ggctttggcc gtaccggtaa cacctggggc tgcgtgacct atgattttac cccggatgcg 840
 attattagca gtaaaaacct aaccgcgggt ttttttccgg taggcgcggg gattctgggt 900
 ccggaactga gcaaactgtt ggaaaccgcg attgaagcga tcggcgaatt tccgcatggt 960
 tttaccgcgg gcggccatcc ggtgggttgt gcgattgcgc tgaaagcgat tgatgtggtg 1020
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 aaacatattg cggaactgcc gaacattggc gaatatcgtg gcattggctt tatgtgggcg 1140
 ctggaagcgg tgaaagataa agcgagcaaa gccccgtttg atggcaacct gagcgtgagc 1200
 gaacgtattg cgaacacctg caccgatctg ggcctgattt gccgtccgac aggccagagc 1260
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 ctggaaaaag cgctggataa agtgtttgcg gaagtggcg 1359

<210> 108
 <211> 453
 <212> PRT
 <213> Artificial Sequence

CX2-126USP1_ST25

<220>

<223> Engineered variant of V. fluvialis transaminase

<400> 108

Met Asn Lys Pro Gln Ser Trp Glu Thr Arg Ala Glu Thr Tyr Ser Leu
1 5 10 15

Tyr Gly Phe Thr Asp Met Pro Ser Leu His Gln Arg Gly Thr Val Val
20 25 30

Val Ala His Gly Glu Gly Pro Tyr Ile Val Asp Val His Gly Arg Arg
35 40 45

Tyr Leu Asp Ala Asn Ser Gly Ala Leu Asn Met Val Ala Gly Phe Asp
50 55 60

His Lys Gly Leu Ile Asp Ala Ala Lys Ala Gln Tyr Glu Arg Phe Pro
65 70 75 80

Gly Tyr His Ala Phe Ser Gly His Met Ser Asp Gln Thr Val Met Leu
85 90 95

Ser Glu Lys Leu Val Glu Val Ser Pro Phe Asp Ser Gly Arg Val Phe
100 105 110

Pro Thr Asn Ser Gly Ser Glu Ala Asn Asp Thr Met Val Lys Met Leu
115 120 125

Trp Phe Leu His Ala Ala Glu Gly Lys Pro Gln Lys Arg Lys Ile Leu
130 135 140

Thr Arg Trp Asn Ala Tyr His Gly Cys Thr Val Val Ser Ala Ser Met
145 150 155 160

Thr Gly Phe Pro Tyr Asn Ser Val Phe Gly Leu Pro Leu Pro Gly Phe
165 170 175

Leu His Leu Thr Cys Pro His Tyr Trp Arg Tyr Gly Glu Glu Gly Glu
180 185 190

Thr Glu Glu Gln Phe Val Ala Arg Leu Ala Arg Glu Leu Glu Glu Thr
195 200 205

Ile Gln Lys Glu Gly Ala Asp Thr Ile Ala Gly Phe Phe Ala Glu Pro
210 215 220

Val Met Gly Ala Gly Gly Val Ile Pro Pro Ala Lys Gly Tyr Phe Gln
225 230 235 240

Ala Ile Leu Pro Ile Leu Arg Lys Tyr Asp Ile Pro Val Ile Ser Asp
245 250 255

CX2-126USP1_ST25

Glu Val Ile Cys Gly Phe Gly Arg Thr Gly Asn Thr Trp Gly Cys Val
260 265 270

Thr Tyr Asp Phe Thr Pro Asp Ala Ile Ile Ser Ser Lys Asn Leu Thr
275 280 285

Ala Gly Phe Phe Pro Val Gly Ala Val Ile Leu Gly Pro Glu Leu Ser
290 295 300

Lys Arg Leu Glu Thr Ala Ile Glu Ala Ile Gly Glu Phe Pro His Gly
305 310 315 320

Phe Thr Ala Gly Gly His Pro Val Gly Cys Ala Ile Ala Leu Lys Ala
325 330 335

Ile Asp Val Val Met Asn Glu Gly Leu Ala Glu Asn Val Arg Arg Leu
340 345 350

Ala Pro Arg Phe Glu Glu Arg Leu Lys His Ile Ala Glu Arg Pro Asn
355 360 365

Ile Gly Glu Tyr Arg Gly Ile Gly Phe Met Trp Ala Leu Glu Ala Val
370 375 380

Lys Asp Lys Ala Ser Lys Ala Pro Phe Asp Gly Asn Leu Ser Val Ser
385 390 395 400

Glu Arg Ile Ala Asn Thr Cys Thr Asp Leu Gly Leu Ile Cys Arg Pro
405 410 415

Thr Gly Gln Ser Val Val Leu Cys Pro Pro Phe Ile Leu Thr Glu Ala
420 425 430

Gln Met Asp Glu Met Phe Asp Lys Leu Glu Lys Ala Leu Asp Lys Val
435 440 445

Phe Ala Glu Val Ala
450

<210> 109
<211> 1359
<212> DNA
<213> Artificial Sequence

<220>
<223> Engineered variant of V. fluvialis transaminase

<400> 109
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gatatgccga gcctgcatca gcgtggcacc gtggtggtgg cccatggcga aggcccgat 120
atcgtggatg tgcattggccg tcgttatctg gatgcgaaca gcggcgcttt gaacatggtg 180
Page 145

CX2-126USP1_ST25

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gtggaagtga gcccgtttga tagcggccgt gtgttttctta ccaacagcgg cagcgaagcg      360
aacgatacca tgggtgaaaat gctgtggttt ctgcatgcgg cggaaggcaa accgcagaaa      420
cgtaaaattc tgaccctgtt gaacgcgtat catggctgtta ccgtagtgag cgcgagcatg      480
accggctttc cgtataacag cgtgtttggc ctgccgctgc cgggctttct gcatctgacc      540
tgcccgcatc attggcggtt tggcgaagaa ggcgaaaccg aagaacagtt tgtcgcgcgt      600
ctggcccgtg aactggaaga aaccattcag aaggaaaggcg cggataccat tgcgggcttt      660
tttgcggaac cggtgatggg tgctggcggg gttattccgc cggcgaaagg ctattttcag      720
gcgattctgc cgatcctgcg caaatatgat attccggtga tcagcgatga agtgatttgc      780
ggctttggcc gtaccggtta cacctggggc tgcgtgacct atgattttac cccggatgcg      840
attattagca gtaaaaacct aaccgcgggt ttttttccgg taggcgcggg gattctgggt      900
ccggaactga gcaaacgtct ggaaaccgcg attgaagcga tcggcgaatt tccgcatggt      960
tttaccgcgg gcggccatcc ggtgggttgt gcgattgcgc tgaaagcgat tgatgtggtg     1020
atgaacgaag gcctggccga aaacgtgcgt cgtctggccc cgcgttttga agaacgtctg     1080
aaacatattg cggaacgtcc gaacattggc gaatatcgtg gcattggctt tatgtgggcg     1140
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gaacgtattg cgaacacctg caccgatctg ggcctgattt gccgtccgac aggccagagc     1260
gtggttctgt gcccgcggtt tattctgacc gaagcgcaga tggatgaaat gttcgataaa     1320
ctggaaaaag cgctggataa agtgtttgcg gaagtggcg      1359

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<210> 110
 <211> 453
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> Engineered variant of V. fluvialis transaminase

<400> 110

Met Asn Lys Pro Gln Ser Trp Glu Thr Arg Ala Glu Thr Tyr Ser Leu
 1 5 10 15

Tyr Gly Phe Thr Asp Met Pro Ser Leu His Gln Arg Gly Thr Val Val
 20 25 30

Val Ala His Gly Glu Gly Pro Tyr Ile Val Asp Val His Gly Arg Arg
 35 40 45

Tyr Leu Asp Ala Asn Ser Gly Ala Leu Asn Met Val Ala Gly Phe Asp
 50 55 60

CX2-126USP1_ST25

His Lys Gly Leu Ile Asp Ala Ala Lys Ala Gln Tyr Glu Arg Phe Pro
 65 70 75 80
 Gly Tyr His Ala Phe Ser Gly His Met Ser Asp Gln Thr Val Met Leu
 85 90 95
 Ser Glu Lys Leu Val Glu Val Ser Pro Phe Asp Ser Gly Arg Val Phe
 100 105 110
 Leu Thr Asn Ser Gly Ser Glu Ala Asn Asp Thr Met Val Lys Met Leu
 115 120 125
 Trp Phe Leu His Ala Ala Glu Gly Lys Pro Gln Lys Arg Lys Ile Leu
 130 135 140
 Thr Arg Trp Asn Ala Tyr His Gly Cys Thr Val Val Ser Ala Ser Met
 145 150 155 160
 Thr Gly Phe Pro Tyr Asn Ser Val Phe Gly Leu Pro Leu Pro Gly Phe
 165 170 175
 Leu His Leu Thr Cys Pro His Tyr Trp Arg Tyr Gly Glu Glu Gly Glu
 180 185 190
 Thr Glu Glu Gln Phe Val Ala Arg Leu Ala Arg Glu Leu Glu Glu Thr
 195 200 205
 Ile Gln Lys Glu Gly Ala Asp Thr Ile Ala Gly Phe Phe Ala Glu Pro
 210 215 220
 Val Met Gly Ala Gly Gly Val Ile Pro Pro Ala Lys Gly Tyr Phe Gln
 225 230 235 240
 Ala Ile Leu Pro Ile Leu Arg Lys Tyr Asp Ile Pro Val Ile Ser Asp
 245 250 255
 Glu Val Ile Cys Gly Phe Gly Arg Thr Gly Asn Thr Trp Gly Cys Val
 260 265 270
 Thr Tyr Asp Phe Thr Pro Asp Ala Ile Ile Ser Ser Lys Asn Leu Thr
 275 280 285
 Ala Gly Phe Phe Pro Val Gly Ala Val Ile Leu Gly Pro Glu Leu Ser
 290 295 300
 Lys Arg Leu Glu Thr Ala Ile Glu Ala Ile Gly Glu Phe Pro His Gly
 305 310 315 320
 Phe Thr Ala Gly Gly His Pro Val Gly Cys Ala Ile Ala Leu Lys Ala
 325 330 335

CX2-126USP1_ST25

Ile Asp Val Val Met Asn Glu Gly Leu Ala Glu Asn Val Arg Arg Leu
340 345 350

Ala Pro Arg Phe Glu Glu Arg Leu Lys His Ile Ala Glu Arg Pro Asn
355 360 365

Ile Gly Glu Tyr Arg Gly Ile Gly Phe Met Trp Ala Leu Glu Ala Val
370 375 380

Lys Asp Lys Ala Ser Lys Ala Pro Phe Asp Gly Asn Leu Ser Val Ser
385 390 395 400

Glu Arg Ile Ala Asn Thr Cys Thr Asp Leu Gly Leu Ile Cys Arg Pro
405 410 415

Thr Gly Gln Ser Val Val Leu Cys Pro Pro Phe Ile Leu Thr Glu Ala
420 425 430

Gln Met Asp Glu Met Phe Asp Lys Leu Glu Lys Ala Leu Asp Lys Val
435 440 445

Phe Ala Glu Val Ala
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<210> 111
<211> 1359
<212> DNA
<213> Artificial Sequence

<220>
<223> Engineered variant of v. fluvialis transaminase

<400> 111
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gcgggctttg atcataaagg cctgattgat gcggcgaaaag cgcagtatga acgttttccg 240
ggctatcatg cgttttcagg ccatatgagc gatcagaccg tgatgctgtc tgaaaaactg 300
gtggaagtga gcccgtttga tagcggccgt gtgttttgta ccaacagcgg cagcgaagcg 360
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cgtaaaattc tgaccggttg gaacgcgtat catggctgta ccgtagtgag cgcgagcatg 480
accggctttc cgtataacag cgtgtttggc ctgccgctgc cgggctttct gcatctgacc 540
tgcccgcatc attggcggtt tggcgaagaa ggcgaaaccg aagaacagtt tgtcgcgcgt 600
ctggcccgtg aactggaaga aaccattcag aaggaaaggcg cggataccat tgcgggcttt 660
tttgcggaac cggatgatggg tgctggcggg gttattccgc cggcgaaagg ctattttcag 720
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CX2-126USP1_ST25

attattagca gtaaaaacct aaccgcgggt ttttttccgg taggcgcggt gattctgggt 900
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 gaacgtattg cgaacacctg caccgatctg ggctgattt gccgtccgac aggccagagc 1260
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<210> 112
 <211> 453
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> Engineered variant of V. fluvialis transaminase
 <400> 112

Met Asn Lys Pro Gln Ser Trp Glu Thr Arg Ala Glu Thr Tyr Ser Leu
 1 5 10 15

Tyr Gly Phe Thr Asp Met Pro Ser Leu His Gln Arg Gly Thr Val Val
 20 25 30

Val Ala His Gly Glu Gly Pro Tyr Ile Val Asp Val His Gly Arg Arg
 35 40 45

Tyr Leu Asp Ala Asn Ser Gly Ala Leu Asn Met Val Ala Gly Phe Asp
 50 55 60

His Lys Gly Leu Ile Asp Ala Ala Lys Ala Gln Tyr Glu Arg Phe Pro
 65 70 75 80

Gly Tyr His Ala Phe Ser Gly His Met Ser Asp Gln Thr Val Met Leu
 85 90 95

Ser Glu Lys Leu Val Glu Val Ser Pro Phe Asp Ser Gly Arg Val Phe
 100 105 110

Cys Thr Asn Ser Gly Ser Glu Ala Asn Asp Thr Met Val Lys Met Leu
 115 120 125

Trp Phe Leu His Ala Ala Glu Gly Lys Pro Gln Lys Arg Lys Ile Leu
 130 135 140

Thr Arg Trp Asn Ala Tyr His Gly Cys Thr Val Val Ser Ala Ser Met
 145 150 155 160

CX2-126USP1_ST25

Thr Gly Phe Pro Tyr 165 Asn Ser Val Phe Gly 170 Leu Pro Leu Pro Gly 175 Phe
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 Thr Glu Glu 195 Gln Phe Val Ala Arg 200 Leu Ala Arg Glu Leu 205 Glu Glu Thr
 Ile Gln 210 Lys Glu Gly Ala Asp 215 Thr Ile Ala Gly Phe 220 Phe Ala Glu Pro
 Val 225 Met Gly Ala Gly Gly 230 Val Ile Pro Pro Ala 235 Lys Gly Tyr Phe Gln 240
 Ala Ile Leu Pro Ile 245 Leu Arg Lys Tyr Asp 250 Ile Pro Val Ile Ser 255 Asp
 Glu Val Ile Cys 260 Gly Phe Gly Arg Thr 265 Gly Asn Thr Trp Gly 270 Cys Val
 Thr Tyr Asp 275 Phe Thr Pro Asp Ala 280 Ile Ile Ser Ser Lys 285 Asn Leu Thr
 Ala Gly 290 Phe Phe Pro Val Gly 295 Ala Val Ile Leu Gly 300 Pro Glu Leu Ser
 Lys 305 Arg Leu Glu Thr Ala 310 Ile Glu Ala Ile Gly 315 Glu Phe Pro His Gly 320
 Phe Thr Ala Gly Gly 325 His Pro Val Gly Cys 330 Ala Ile Ala Leu Lys 335 Ala
 Ile Asp Val Val 340 Met Asn Glu Gly Leu 345 Ala Glu Asn Val Arg 350 Arg Leu
 Ala Pro Arg 355 Phe Glu Glu Arg Leu 360 Lys His Ile Ala Glu 365 Arg Pro Asn
 Ile Gly 370 Glu Tyr Arg Gly Ile 375 Gly Phe Met Trp Ala 380 Leu Glu Ala Val
 Lys 385 Asp Lys Ala Ser Lys 390 Ala Pro Phe Asp Gly 395 Asn Leu Ser Val Ser 400
 Glu Arg Ile Ala Asn 405 Thr Cys Thr Asp Leu 410 Gly Leu Ile Cys Arg 415 Pro
 Thr Gly Gln Ser 420 Val Val Leu Cys Pro 425 Pro Phe Ile Leu Thr 430 Glu Ala

Gln Met Asp Glu Met Phe Asp Lys Leu Glu Lys Ala Leu Asp Lys Val
 435 440 445

Phe Ala Glu Val Ala
 450

<210> 113
 <211> 1359
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Engineered variant of V. fluvialis transaminase

<400> 113
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 gcgggctttg atcataaagg cctgattgat gcggcgaaag cgcagtatga acgttttccg 240
 ggctatcatg cgttttcagg ccatatgagc gatcagaccg tgatgctgtc tgaaaaactg 300
 gtggaagtga gcccgtttga tagcggccgt gtgttttata ccaacagcgg cagcgaagcg 360
 aacgatacca tgggtgaaaat gctgtggttt ctgcatgcgg cggaaggcaa accgcagaaa 420
 cgtaaaattc tgaccctgtg taacgcgtat catggctgta ccgtagtgag cgcgagcatg 480
 accggctttc cgtataacag cgtgtttggc ctgccgctgc cgggctttct gcattctgacc 540
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 ctggcccgtg aactggaaga aaccattcag aagggaaggc cggaaccat tgccgggcttt 660
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 ggctttggcc gtaccggtaa cacctggggc tgcgtgacct atgattttac cccggatgcg 840
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 ctggaaaaag cgctggataa agtggtttgcg gaagtggcg 1359

<210> 114
 <211> 453

<212> PRT

<213> Artificial Sequence

<220>

<223> Engineered variant of *V. fluvialis* transaminase

<400> 114

Met Asn Lys Pro Gln Ser Trp Glu Thr Arg Ala Glu Thr Tyr Ser Leu
 1 5 10 15

Tyr Gly Phe Thr Asp Met Pro Ser Leu His Gln Arg Gly Thr Val Val
 20 25 30

Val Ala His Gly Glu Gly Pro Tyr Ile Val Asp Val His Gly Arg Arg
 35 40 45

Tyr Leu Asp Ala Asn Ser Gly Ala Leu Asn Met Val Ala Gly Phe Asp
 50 55 60

His Lys Gly Leu Ile Asp Ala Ala Lys Ala Gln Tyr Glu Arg Phe Pro
 65 70 75 80

Gly Tyr His Ala Phe Ser Gly His Met Ser Asp Gln Thr Val Met Leu
 85 90 95

Ser Glu Lys Leu Val Glu Val Ser Pro Phe Asp Ser Gly Arg Val Phe
 100 105 110

Tyr Thr Asn Ser Gly Ser Glu Ala Asn Asp Thr Met Val Lys Met Leu
 115 120 125

Trp Phe Leu His Ala Ala Glu Gly Lys Pro Gln Lys Arg Lys Ile Leu
 130 135 140

Thr Arg Val Asn Ala Tyr His Gly Cys Thr Val Val Ser Ala Ser Met
 145 150 155 160

Thr Gly Phe Pro Tyr Asn Ser Val Phe Gly Leu Pro Leu Pro Gly Phe
 165 170 175

Leu His Leu Thr Cys Pro His Tyr Trp Arg Tyr Gly Glu Glu Gly Glu
 180 185 190

Thr Glu Glu Gln Phe Val Ala Arg Leu Ala Arg Glu Leu Glu Glu Thr
 195 200 205

Ile Gln Lys Glu Gly Ala Asp Thr Ile Ala Gly Phe Phe Ala Glu Pro
 210 215 220

Val Met Gly Ala Gly Gly Val Ile Pro Pro Ala Lys Gly Tyr Phe Gln
 225 230 235 240

CX2-126USP1_ST25

Ala Ile Leu Pro Ile Leu Arg Lys Tyr Asp Ile Pro Val Ile Ser Asp
245 250 255

Glu Val Ile Cys Gly Phe Gly Arg Thr Gly Asn Thr Trp Gly Cys Val
260 265 270

Thr Tyr Asp Phe Thr Pro Asp Ala Ile Ile Ser Ser Lys Asn Leu Thr
275 280 285

Ala Gly Phe Phe Pro Val Gly Ala Val Ile Leu Gly Pro Glu Leu Ser
290 295 300

Lys Arg Leu Glu Thr Ala Ile Glu Ala Ile Gly Glu Phe Pro His Gly
305 310 315 320

Phe Thr Ala Gly Gly His Pro Val Gly Cys Ala Ile Ala Leu Lys Ala
325 330 335

Ile Asp Val Val Met Asn Glu Gly Leu Ala Glu Asn Val Arg Arg Leu
340 345 350

Ala Pro Arg Phe Glu Glu Arg Leu Lys His Ile Ala Glu Arg Pro Asn
355 360 365

Ile Gly Glu Tyr Arg Gly Ile Gly Phe Met Trp Ala Leu Glu Ala Val
370 375 380

Lys Asp Lys Ala Ser Lys Ala Pro Phe Asp Gly Asn Leu Ser Val Ser
385 390 395 400

Glu Arg Ile Ala Asn Thr Cys Thr Asp Leu Gly Leu Ile Cys Arg Pro
405 410 415

Thr Gly Gln Ser Val Val Leu Cys Pro Pro Phe Ile Leu Thr Glu Ala
420 425 430

Gln Met Asp Glu Met Phe Asp Lys Leu Glu Lys Ala Leu Asp Lys Val
435 440 445

Phe Ala Glu Val Ala
450

<210> 115
<211> 1359
<212> DNA
<213> Artificial Sequence

<220>
<223> Engineered variant of v. fluvialis transaminase

<400> 115
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gatatgccga gcctgcatca gcgtggcacc gtggtggtgg cccatggcga aggcccgtat 120
Page 153

CX2-126USP1_ST25

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ggctatcatg cgtttttcagg ccatatgagc gatcagaccg tgatgctgtc tgaaaaactg      300
gtggaagtga gcccgtttga tagcggccgt gtgtttttata ccaacagcgg cagcgaagcg      360
aacgatacca tgggtgaaaat gctgtgggtt ctgcatgcgg cggaaggcaa accgcagaaa      420
cgtaaaattc tgacccgtca taacgcgtat catggctgta ccgtagtgag cgcgagcatg      480
accggctttc cgtataacag cgtgtttggc ctgccgctgc cgggctttct gcatctgacc      540
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ctggcccgtg aactggaaga aaccattcag aagggaaggcg cggataccat tgcgggcttt      660
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gcgattctgc cgatcctgcg caaatatgat attccgggtg tcagcgatga agtgatttgc      780
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ccggaactga gcaaacgtct ggaaaccgcg attgaagcga tcggcgaatt tccgcatggg      960
tttaccgcgg gcggccatcc ggtgggttgt gcgattgcgc tgaaagcgat tgatgtgggt      1020
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aaacatattg cggaaacgtc gaacattggc gaatatcgtg gcattggctt tatgtgggcg      1140
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gaacgtattg cgaacacctg caccgatctg ggcctgattt gccgtccgac aggccagagc      1260
gtggttctgt gcccgcggtt tattctgacc gaagcgcaga tggatgaaat gttcgataaa      1320
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<210> 116

<211> 453

<212> PRT

<213> Artificial Sequence

<220>

<223> Engineered variant of V. fluvialis transaminase

<400> 116

Met Asn Lys Pro Gln Ser Trp Glu Thr Arg Ala Glu Thr Tyr Ser Leu
1 5 10 15

Tyr Gly Phe Thr Asp Met Pro Ser Leu His Gln Arg Gly Thr Val Val
20 25 30

Val Ala His Gly Glu Gly Pro Tyr Ile Val Asp Val His Gly Arg Arg
35 40 45

Tyr Leu Asp Ala Asn Ser Gly Ala Leu Asn Met Val Ala Gly Phe Asp
50 55 60

CX2-126USP1_ST25

His Lys Gly Leu Ile Asp Ala Ala Lys Ala Gln Tyr Glu Arg Phe Pro
 65 70 75 80
 Gly Tyr His Ala Phe Ser Gly His Met Ser Asp Gln Thr Val Met Leu
 85 90 95
 Ser Glu Lys Leu Val Glu Val Ser Pro Phe Asp Ser Gly Arg Val Phe
 100 105 110
 Tyr Thr Asn Ser Gly Ser Glu Ala Asn Asp Thr Met Val Lys Met Leu
 115 120 125
 Trp Phe Leu His Ala Ala Glu Gly Lys Pro Gln Lys Arg Lys Ile Leu
 130 135 140
 Thr Arg His Asn Ala Tyr His Gly Cys Thr Val Val Ser Ala Ser Met
 145 150 155 160
 Thr Gly Phe Pro Tyr Asn Ser Val Phe Gly Leu Pro Leu Pro Gly Phe
 165 170 175
 Leu His Leu Thr Cys Pro His Tyr Trp Arg Tyr Gly Glu Glu Gly Glu
 180 185 190
 Thr Glu Glu Gln Phe Val Ala Arg Leu Ala Arg Glu Leu Glu Glu Thr
 195 200 205
 Ile Gln Lys Glu Gly Ala Asp Thr Ile Ala Gly Phe Phe Ala Glu Pro
 210 215 220
 Val Met Gly Ala Gly Gly Val Ile Pro Pro Ala Lys Gly Tyr Phe Gln
 225 230 235 240
 Ala Ile Leu Pro Ile Leu Arg Lys Tyr Asp Ile Pro Val Ile Ser Asp
 245 250 255
 Glu Val Ile Cys Gly Phe Gly Arg Thr Gly Asn Thr Trp Gly Cys Val
 260 265 270
 Thr Tyr Asp Phe Thr Pro Asp Ala Ile Ile Ser Ser Lys Asn Leu Thr
 275 280 285
 Ala Gly Phe Phe Pro Val Gly Ala Val Ile Leu Gly Pro Glu Leu Ser
 290 295 300
 Lys Arg Leu Glu Thr Ala Ile Glu Ala Ile Gly Glu Phe Pro His Gly
 305 310 315 320
 Phe Thr Ala Gly Gly His Pro Val Gly Cys Ala Ile Ala Leu Lys Ala
 325 330 335

CX2-126USP1_ST25

Ile Asp Val Val Met Asn Glu Gly Leu Ala Glu Asn Val Arg Arg Leu
340 345 350

Ala Pro Arg Phe Glu Glu Arg Leu Lys His Ile Ala Glu Arg Pro Asn
355 360 365

Ile Gly Glu Tyr Arg Gly Ile Gly Phe Met Trp Ala Leu Glu Ala Val
370 375 380

Lys Asp Lys Ala Ser Lys Ala Pro Phe Asp Gly Asn Leu Ser Val Ser
385 390 395 400

Glu Arg Ile Ala Asn Thr Cys Thr Asp Leu Gly Leu Ile Cys Arg Pro
405 410 415

Thr Gly Gln Ser Val Val Leu Cys Pro Pro Phe Ile Leu Thr Glu Ala
420 425 430

Gln Met Asp Glu Met Phe Asp Lys Leu Glu Lys Ala Leu Asp Lys Val
435 440 445

Phe Ala Glu Val Ala
450

<210> 117
<211> 1359
<212> DNA
<213> Artificial sequence

<220>
<223> Engineered variant of v. fluvialis transaminase

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gcgggctttg atcataaagg cctgattgat gcggcgaaag cgcagtatga acgttttccg 240
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tgcccgcatt attggcggtta tggcgaagaa ggcgaaaccg aagaacagtt tgtcgcgcgt 600
ctggcccgtg aactggaaga aaccattcag aagggaaggcg cggataccat tgcgggcttt 660
tttgcggaac cgggtgatggg tgctggcggg gttattccgc cggcgaaagg ctattttcag 720
gcgattctgc cgatcctgcg caaatatgat attccgggtga tcagcgatga agtgatttgc 780

CX2-126USP1_ST25

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<210> 118

<211> 453

<212> PRT

<213> Artificial Sequence

<220>

<223> Engineered variant of V. fluvialis transaminase

<400> 118

Met Asn Lys Pro Gln Ser Trp Glu Thr Arg Ala Glu Thr Tyr Ser Leu
1 5 10 15

Tyr Gly Phe Thr Asp Met Pro Ser Leu His Gln Arg Gly Thr Val Val
20 25 30

Val Ala His Gly Glu Gly Pro Tyr Ile Val Asp Val His Gly Arg Arg
35 40 45

Tyr Leu Asp Ala Asn Ser Gly Ala Leu Asn Met Val Ala Gly Phe Asp
50 55 60

His Lys Gly Leu Ile Asp Ala Ala Lys Ala Gln Tyr Glu Arg Phe Pro
65 70 75 80

Gly Tyr His Ala Phe Ser Gly His Met Ser Asp Gln Thr Val Met Leu
85 90 95

Ser Glu Lys Leu Val Glu Val Ser Pro Phe Asp Ser Gly Arg Val Phe
100 105 110

Tyr Thr Asn Ser Gly Ser Glu Ala Asn Asp Thr Met Val Lys Met Leu
115 120 125

Trp Phe Leu His Ala Ala Glu Gly Lys Pro Gln Lys Arg Lys Ile Leu
130 135 140

CX2-126USP1_ST25

Thr Arg Trp Asn Ala Tyr His Gly Cys Thr Val Val Ser Ala Ser Met
145 150 155 160

Thr Gly Phe Pro Tyr Asn Ser Val Phe Gly Leu Pro Leu Pro Gly Phe
165 170 175

Leu Trp Leu Thr Cys Pro His Tyr Trp Arg Tyr Gly Glu Glu Gly Glu
180 185 190

Thr Glu Glu Gln Phe Val Ala Arg Leu Ala Arg Glu Leu Glu Glu Thr
195 200 205

Ile Gln Lys Glu Gly Ala Asp Thr Ile Ala Gly Phe Phe Ala Glu Pro
210 215 220

Val Met Gly Ala Gly Gly Val Ile Pro Pro Ala Lys Gly Tyr Phe Gln
225 230 235 240

Ala Ile Leu Pro Ile Leu Arg Lys Tyr Asp Ile Pro Val Ile Ser Asp
245 250 255

Glu Val Ile Cys Gly Phe Gly Arg Thr Gly Asn Thr Trp Gly Cys Val
260 265 270

Thr Tyr Asp Phe Thr Pro Asp Ala Ile Ile Ser Ser Lys Asn Leu Thr
275 280 285

Ala Gly Phe Phe Pro Val Gly Ala Val Ile Leu Gly Pro Glu Leu Ser
290 295 300

Lys Arg Leu Glu Thr Ala Ile Glu Ala Ile Gly Glu Phe Pro His Gly
305 310 315 320

Phe Thr Ala Gly Gly His Pro Val Gly Cys Ala Ile Ala Leu Lys Ala
325 330 335

Ile Asp Val Val Met Asn Glu Gly Leu Ala Glu Asn Val Arg Arg Leu
340 345 350

Ala Pro Arg Phe Glu Glu Arg Leu Lys His Ile Ala Glu Arg Pro Asn
355 360 365

Ile Gly Glu Tyr Arg Gly Ile Gly Phe Met Trp Ala Leu Glu Ala Val
370 375 380

Lys Asp Lys Ala Ser Lys Ala Pro Phe Asp Gly Asn Leu Ser Val Ser
385 390 395 400

Glu Arg Ile Ala Asn Thr Cys Thr Asp Leu Gly Leu Ile Cys Arg Pro
405 410 415

CX2-126USP1_ST25

Thr Gly Gln Ser Val Val Leu Cys Pro Pro Phe Ile Leu Thr Glu Ala
420 425 430

Gln Met Asp Glu Met Phe Asp Lys Leu Glu Lys Ala Leu Asp Lys Val
435 440 445

Phe Ala Glu Val Ala
450

<210> 119
<211> 1359
<212> DNA
<213> Artificial Sequence

<220>
<223> Engineered variant of *V. fluvialis* transaminase

<400> 119
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gcgggctttg atcataaagg cctgattgat gcggcgaaaag cgcagtatga acgttttccg 240
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tgcccgcatc attggcggtt tggcgaagaa ggcgaaaccg aagaacagtt tgcgcgcgt 600
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CX2-126USP1_ST25

<210> 120
 <211> 453
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> Engineered variant of *V. fluvialis* transaminase

<400> 120

Met Asn Lys Pro Gln Ser Trp Glu Thr Arg Ala Glu Thr Tyr Ser Leu
 1 5 10 15

Tyr Gly Phe Thr Asp Met Pro Ser Leu His Gln Arg Gly Thr Val Val
 20 25 30

Val Ala His Gly Glu Gly Pro Tyr Ile Val Asp Val His Gly Arg Arg
 35 40 45

Tyr Leu Asp Ala Asn Ser Gly Ala Leu Asn Met Val Ala Gly Phe Asp
 50 55 60

His Lys Gly Leu Ile Asp Ala Ala Lys Ala Gln Tyr Glu Arg Phe Pro
 65 70 75 80

Gly Tyr His Ala Phe Ser Gly His Met Ser Asp Gln Thr Val Met Leu
 85 90 95

Ser Glu Lys Leu Val Glu Val Ser Pro Phe Asp Ser Gly Arg Val Phe
 100 105 110

Tyr Thr Asn Ser Gly Ser Glu Ala Asn Asp Thr Met Val Lys Met Leu
 115 120 125

Trp Phe Leu His Ala Ala Glu Gly Lys Pro Gln Lys Arg Lys Ile Leu
 130 135 140

Thr Arg Trp Asn Ala Tyr His Gly Cys Thr Val Val Ser Ala Ser Met
 145 150 155 160

Thr Gly Phe Pro Tyr Asn Ser Val Phe Gly Leu Pro Leu Pro Gly Phe
 165 170 175

Leu His Leu Thr Cys Pro His Tyr Trp Arg Tyr Gly Glu Glu Gly Glu
 180 185 190

Thr Glu Glu Gln Phe Val Ala Arg Leu Ala Arg Glu Leu Glu Glu Thr
 195 200 205

Ile Gln Lys Glu Gly Ala Asp Thr Ile Ala Gly Phe Phe Ala Glu Pro
 210 215 220

Val Met Gly Ala Gly Gly Val Ile Val Pro Ala Lys Gly Tyr Phe Gln
 225 230 235 240

CX2-126USP1_ST25

Ala Ile Leu Pro Ile Leu Arg Lys Tyr Asp Ile Pro Val Ile Ser Asp
245 250 255

Glu Val Ile Cys Gly Phe Gly Arg Thr Gly Asn Thr Trp Gly Cys Val
260 265 270

Thr Tyr Asp Phe Thr Pro Asp Ala Ile Ile Ser Ser Lys Asn Leu Thr
275 280 285

Ala Gly Phe Phe Pro Val Gly Ala Val Ile Leu Gly Pro Glu Leu Ser
290 295 300

Lys Arg Leu Glu Thr Ala Ile Glu Ala Ile Gly Glu Phe Pro His Gly
305 310 315 320

Phe Thr Ala Gly Gly His Pro Val Gly Cys Ala Ile Ala Leu Lys Ala
325 330 335

Ile Asp Val Val Met Asn Glu Gly Leu Ala Glu Asn Val Arg Arg Leu
340 345 350

Ala Pro Arg Phe Glu Glu Arg Leu Lys His Ile Ala Glu Arg Pro Asn
355 360 365

Ile Gly Glu Tyr Arg Gly Ile Gly Phe Met Trp Ala Leu Glu Ala Val
370 375 380

Lys Asp Lys Ala Ser Lys Ala Pro Phe Asp Gly Asn Leu Ser Val Ser
385 390 395 400

Glu Arg Ile Ala Asn Thr Cys Thr Asp Leu Gly Leu Ile Cys Arg Pro
405 410 415

Thr Gly Gln Ser Val Val Leu Cys Pro Pro Phe Ile Leu Thr Glu Ala
420 425 430

Gln Met Asp Glu Met Phe Asp Lys Leu Glu Lys Ala Leu Asp Lys Val
435 440 445

Phe Ala Glu Val Ala
450

<210> 121
<211> 1359
<212> DNA
<213> Artificial Sequence

<220>
<223> Engineered variant of v. fluvialis transaminase

<400> 121
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Page 161

CX2-126USP1_ST25

gatatgccga gcctgcatca gcgtggcacc gtggtggtgg cccatggcga agggccgtat 120
 atcgtggatg tgcattggccg tcgttatctg gatgcgaaca gcggcgcttt gaacatggtg 180
 gcgggctttg atcataaagg cctgattgat gcggcgaaaag cgcagtatga acgttttccg 240
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 aacgatacca tgggtgaaaat gctgtggttt ctgcatgcgg cggaaggcaa accgcagaaa 420
 cgtaaaattc tgaccggtt gaacgcgtat catggctgta ccgtagtgag cgcgagcatg 480
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 ctggcccgtg aactggaaga aaccattcag aaggaaggcg cggataccat tgcgggcttt 660
 tttgcggaac cgggtgatggg tgctggcggg gttattccgc cggcgaaaagg ctattttcag 720
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 ccggaactga gcaaactgtt ggaaaccgcg attgaagcga tcggcgaatt tccgcatggt 960
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 ctggaaaaag cgctggataa agtggttgcg gaagtggcg 1359

<210> 122
 <211> 453
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> Engineered variant of V. fluvialis transaminase
 <400> 122

Met Asn Lys Pro Gln Ser Trp Glu Thr Arg Ala Glu Thr Tyr Ser Leu
 1 5 10 15

Tyr Gly Phe Thr Asp Met Pro Ser Leu His Gln Arg Gly Thr Val Val
 20 25 30

Val Ala His Gly Glu Gly Pro Tyr Ile Val Asp Val His Gly Arg Arg
 35 40 45

CX2-126USP1_ST25

Tyr Leu Asp Ala Asn Ser Gly Ala Leu Asn Met Val Ala Gly Phe Asp
 50 55 60
 His Lys Gly Leu Ile Asp Ala Ala Lys Ala Gln Tyr Glu Arg Phe Pro
 65 70 75 80
 Gly Tyr His Ala Phe Ser Gly His Met Ser Asp Gln Thr Val Met Leu
 85 90 95
 Ser Glu Lys Leu Val Glu Val Ser Pro Phe Asp Ser Gly Arg Val Phe
 100 105 110
 Tyr Thr Asn Ser Gly Ser Glu Ala Asn Asp Thr Met Val Lys Met Leu
 115 120 125
 Trp Phe Leu His Ala Ala Glu Gly Lys Pro Gln Lys Arg Lys Ile Leu
 130 135 140
 Thr Arg Trp Asn Ala Tyr His Gly Cys Thr Val Val Ser Ala Ser Met
 145 150 155 160
 Thr Gly Phe Pro Tyr Asn Ser Val Phe Gly Leu Pro Leu Pro Gly Phe
 165 170 175
 Leu His Leu Thr Cys Pro His Tyr Trp Arg Tyr Gly Glu Glu Gly Glu
 180 185 190
 Thr Glu Glu Gln Phe Val Ala Arg Leu Ala Arg Glu Leu Glu Glu Thr
 195 200 205
 Ile Gln Lys Glu Gly Ala Asp Thr Ile Ala Gly Phe Phe Ala Glu Pro
 210 215 220
 Val Met Gly Ala Gly Gly Val Ile Pro Pro Ala Lys Gly Tyr Phe Gln
 225 230 235 240
 Ala Ile Leu Pro Ile Leu Arg Lys Tyr Asp Ile Pro Val Ile Ser Asp
 245 250 255
 Glu Val Ile Cys Gly Phe Gly Arg Thr Gly Asn Thr Trp Gly Cys Val
 260 265 270
 Thr Tyr Asp Phe Thr Pro Asp Ala Ile Ile Ser Ser Lys Asn Leu Thr
 275 280 285
 Ala Gly Phe Phe Pro Val Gly Ala Val Ile Leu Gly Pro Glu Leu Ser
 290 295 300
 Lys Arg Leu Glu Thr Ala Ile Glu Ala Ile Gly Glu Phe Pro His Gly
 305 310 315 320

CX2-126USP1_ST25

Phe Thr Thr Gly Gly His Pro Val Gly Cys Ala Ile Ala Leu Lys Ala
325 330 335

Ile Asp Val Val Met Asn Glu Gly Leu Ala Glu Asn Val Arg Arg Leu
340 345 350

Ala Pro Arg Phe Glu Glu Arg Leu Lys His Ile Ala Glu Arg Pro Asn
355 360 365

Ile Gly Glu Tyr Arg Gly Ile Gly Phe Met Trp Ala Leu Glu Ala Val
370 375 380

Lys Asp Lys Ala Ser Lys Ala Pro Phe Asp Gly Asn Leu Ser Val Ser
385 390 395 400

Glu Arg Ile Ala Asn Thr Cys Thr Asp Leu Gly Leu Ile Cys Arg Pro
405 410 415

Thr Gly Gln Ser Val Val Leu Cys Pro Pro Phe Ile Leu Thr Glu Ala
420 425 430

Gln Met Asp Glu Met Phe Asp Lys Leu Glu Lys Ala Leu Asp Lys Val
435 440 445

Phe Ala Glu Val Ala
450

<210> 123
<211> 1359
<212> DNA
<213> Artificial Sequence

<220>
<223> Engineered variant of V. fluvialis transaminase

<400> 123
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atcgtggatg tgcattggccg tcgttatctg gatgcgaaca gcggcgcttt gaacatggtg 180
gcgggctttg atcataaagg cctgattgat gcggcgaaag cgcagtatga acgttttccg 240
ggctatcatg cgttttcagg ccatatgagc gatcagaccg tgatgctgtc tgaaaaactg 300
gtggaagtga gcccgtttga tagcggccgt gtgttttata ccaacagcgg cagcgaagcg 360
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cgtaaaattc tgaccggtt gaacgcgtat catggctgta ccgtagtgag cgcgagcatg 480
accggctttc cgtataacag cgtgtttggc ctgccgctgc cgggctttct gcatctgacc 540
tgcccgcatc attggcggtta tggcgaagaa ggcgaaaccg aagaacagtt tgtcgcgcgt 600
ctggcccgtg aactggaaga aaccattcag aagggaaggcg cggataccat tgcgggcttt 660
tttgcggaac cgggtgatggg tgctggcggg gttattccgc cggcgaaagg ctattttcag 720

CX2-126USP1_ST25

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 ccggaactga gcaaactgtt ggaaaccgcg attgaagcga tcggcgaatt tccgcatggt 960
 tttaccgcgg gcggccatcc ggtgggttgt gcgattgcgc tgaaagcgat tgatgtggtg 1020
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 aaacatattg cggaactgcc gaacattggc gaatatcgtg gcattggctt tatgtgggcg 1140
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 ctggaaaaag cgctggataa agtgtttgcg gaagtggcg 1359

<210> 124
 <211> 453
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> Engineered variant of V. fluvialis transaminase

<400> 124

Met Asn Lys Pro Gln Ser Trp Glu Thr Arg Ala Glu Thr Tyr Ser Leu
 1 5 10 15

Tyr Gly Phe Thr Asp Met Pro Ser Leu His Gln Arg Gly Thr Val Val
 20 25 30

Val Ala His Gly Glu Gly Pro Tyr Ile Val Asp Val His Gly Arg Arg
 35 40 45

Tyr Leu Asp Ala Asn Ser Gly Ala Leu Asn Met Val Ala Gly Phe Asp
 50 55 60

His Lys Gly Leu Ile Asp Ala Ala Lys Ala Gln Tyr Glu Arg Phe Pro
 65 70 75 80

Gly Tyr His Ala Phe Ser Gly His Met Ser Asp Gln Thr Val Met Leu
 85 90 95

Ser Glu Lys Leu Val Glu Val Ser Pro Phe Asp Ser Gly Arg Val Phe
 100 105 110

Tyr Thr Asn Ser Gly Ser Glu Ala Asn Asp Thr Met Val Lys Met Leu
 115 120 125

Trp Phe Leu His Ala Ala Glu Gly Lys Pro Gln Lys Arg Lys Ile Leu
 130 135 140

CX2-126USP1_ST25

Thr Arg Trp Asn Ala Tyr His Gly Cys Thr Val Val Ser Ala Ser Met
 145 150 155 160
 Thr Gly Phe Pro Tyr Asn Ser Val Phe Gly Leu Pro Leu Pro Gly Phe
 165 170 175
 Leu His Leu Thr Cys Pro His Tyr Trp Arg Tyr Gly Glu Glu Gly Glu
 180 185 190
 Thr Glu Glu Gln Phe Val Ala Arg Leu Ala Arg Glu Leu Glu Glu Thr
 195 200 205
 Ile Gln Lys Glu Gly Ala Asp Thr Ile Ala Gly Phe Phe Ala Glu Pro
 210 215 220
 Val Met Gly Ala Gly Gly Val Ile Pro Pro Ala Lys Gly Tyr Phe Gln
 225 230 235 240
 Ala Ile Leu Pro Ile Leu Arg Lys Tyr Asp Ile Pro Val Ile Ser Asp
 245 250 255
 Glu Val Ile Cys Gly Phe Gly Arg Thr Gly Asn Thr Trp Gly Cys Val
 260 265 270
 Thr Tyr Asp Phe Thr Pro Asp Ala Ile Ile Ser Ser Lys Asn Leu Thr
 275 280 285
 Ala Gly Phe Phe Pro Val Gly Ala Val Ile Leu Gly Pro Glu Leu Ser
 290 295 300
 Lys Arg Leu Glu Thr Ala Ile Glu Ala Ile Gly Glu Phe Pro His Gly
 305 310 315 320
 Phe Thr Ala Gly Gly His Pro Val Gly Cys Ala Ile Ala Leu Lys Ala
 325 330 335
 Ile Asp Val Val Met Asn Glu Gly Leu Ala Glu Asn Val Arg Arg Leu
 340 345 350
 Ala Pro Arg Phe Glu Glu Arg Leu Lys His Ile Ala Glu Arg Pro Asn
 355 360 365
 Ile Gly Glu Tyr Arg Gly Ile Gly Phe Met Trp Ala Leu Glu Thr Val
 370 375 380
 Lys Asp Lys Ala Ser Lys Ala Pro Phe Asp Gly Asn Leu Ser Val Ser
 385 390 395 400
 Glu Arg Ile Ala Asn Thr Cys Thr Asp Leu Gly Leu Ile Cys Arg Pro
 405 410 415

CX2-126USP1_ST25

Thr Gly Gln Ser Val Val Leu Cys Pro Pro Phe Ile Leu Thr Glu Ala
420 425 430

Gln Met Asp Glu Met Phe Asp Lys Leu Glu Lys Ala Leu Asp Lys Val
435 440 445

Phe Ala Glu Val Ala
450

<210> 125
<211> 1359
<212> DNA
<213> Artificial Sequence

<220>
<223> Engineered variant of v. fluvialis transaminase

<400> 125
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gcgggctttg atcataaagg cctgattgat gcggcgaaaag cgcagtatga acgttttccg 240
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gtggaagtga gcccgtttga tagcggccgt gtgttttata ccaacagcgg cagcgaagcg 360
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ctggcccgtg aactggaaga aaccattcag aaggaaaggc cgataccat tgcgggcttt 660
tttgcggaac cggatgatgg tgcgtggcgt gttattccgc cggcgaaagg ctattttcag 720
gcgattctgc cgatcctgcg caaatatgat attccggtga tcagcgatga agtgatttgc 780
ggctttggcc gtaccggtaa cacctggggc tgcgtgacct atgattttac cccggatgcg 840
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ctggaagcgg tgaaagataa agcgagcaaa gccccgtttg atggcaacct gagcgtgagc 1200
gaacgtattg cgaacacctg caccgatctg ggcctgatta ttcgtccgac aggccagagc 1260
gtggttctgt gcccgcggtt tattctgacc gaagcgcaga tggatgaaat gttcgataaa 1320
ctggaaaaag cgctggataa agtggttgcg gaagtggcg 1359

<210> 126
 <211> 453
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> Engineered variant of *V. fluvialis* transaminase

<400> 126

Met Asn Lys Pro Gln Ser Trp Glu Thr Arg Ala Glu Thr Tyr Ser Leu
 1 5 10 15

Tyr Gly Phe Thr Asp Met Pro Ser Leu His Gln Arg Gly Thr Val Val
 20 25 30

Val Ala His Gly Glu Gly Pro Tyr Ile Val Asp Val His Gly Arg Arg
 35 40 45

Tyr Leu Asp Ala Asn Ser Gly Ala Leu Asn Met Val Ala Gly Phe Asp
 50 55 60

His Lys Gly Leu Ile Asp Ala Ala Lys Ala Gln Tyr Glu Arg Phe Pro
 65 70 75 80

Gly Tyr His Ala Phe Ser Gly His Met Ser Asp Gln Thr Val Met Leu
 85 90 95

Ser Glu Lys Leu Val Glu Val Ser Pro Phe Asp Ser Gly Arg Val Phe
 100 105 110

Tyr Thr Asn Ser Gly Ser Glu Ala Asn Asp Thr Met Val Lys Met Leu
 115 120 125

Trp Phe Leu His Ala Ala Glu Gly Lys Pro Gln Lys Arg Lys Ile Leu
 130 135 140

Thr Arg Trp Asn Ala Tyr His Gly Cys Thr Val Val Ser Ala Ser Met
 145 150 155 160

Thr Gly Phe Pro Tyr Asn Ser Val Phe Gly Leu Pro Leu Pro Gly Phe
 165 170 175

Leu His Leu Thr Cys Pro His Tyr Trp Arg Tyr Gly Glu Glu Gly Glu
 180 185 190

Thr Glu Glu Gln Phe Val Ala Arg Leu Ala Arg Glu Leu Glu Glu Thr
 195 200 205

Ile Gln Lys Glu Gly Ala Asp Thr Ile Ala Gly Phe Phe Ala Glu Pro
 210 215 220

CX2-126USP1_ST25

Val Met Gly Ala Gly Gly Val Ile Pro Pro Ala Lys Gly Tyr Phe Gln
225 230 235 240

Ala Ile Leu Pro Ile Leu Arg Lys Tyr Asp Ile Pro Val Ile Ser Asp
245 250 255

Glu Val Ile Cys Gly Phe Gly Arg Thr Gly Asn Thr Trp Gly Cys Val
260 265 270

Thr Tyr Asp Phe Thr Pro Asp Ala Ile Ile Ser Ser Lys Asn Leu Thr
275 280 285

Ala Gly Phe Phe Pro Val Gly Ala Val Ile Leu Gly Pro Glu Leu Ser
290 295 300

Lys Arg Leu Glu Thr Ala Ile Glu Ala Ile Gly Glu Phe Pro His Gly
305 310 315 320

Phe Thr Ala Gly Gly His Pro Val Gly Cys Ala Ile Ala Leu Lys Ala
325 330 335

Ile Asp Val Val Met Asn Glu Gly Leu Ala Glu Asn Val Arg Arg Leu
340 345 350

Ala Pro Arg Phe Glu Glu Arg Leu Lys His Ile Ala Glu Arg Pro Asn
355 360 365

Ile Gly Glu Tyr Arg Gly Ile Gly Phe Met Trp Ala Leu Glu Ala Val
370 375 380

Lys Asp Lys Ala Ser Lys Ala Pro Phe Asp Gly Asn Leu Ser Val Ser
385 390 395 400

Glu Arg Ile Ala Asn Thr Cys Thr Asp Leu Gly Leu Ile Ile Arg Pro
405 410 415

Thr Gly Gln Ser Val Val Leu Cys Pro Pro Phe Ile Leu Thr Glu Ala
420 425 430

Gln Met Asp Glu Met Phe Asp Lys Leu Glu Lys Ala Leu Asp Lys Val
435 440 445

Phe Ala Glu Val Ala
450

<210> 127
<211> 1359
<212> DNA
<213> Artificial sequence

<220>
<223> Engineered variant of v. fluvialis transaminase

CX2-126USP1_ST25

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<400> 127
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atcgtggatg tgcattggccg tcgttatctg gatgcgaaca gcggcgcttt gaacatggtg      180
gcgggctttg atcataaagg cctgattgat gcggcgaaag cgcagtatga acgttttccg      240
ggctatcatg cgttttcagg ccatatgagc gatcagaccg tgatgctgtc tgaaaaactg      300
gtggaagtga gcccgtttga tagcggccgt gtgttttata ccaacagcgg cagcgaagcg      360
aacgatacca tgggtgaaaat gctgtggttt ctgcatgcgg cggaaggcaa accgcagaaa      420
cgtaaaattc tgaccgcttg gaacgcgtat catggctgta ccgtagtgag cgcgagcatg      480
accggctttc cgtataacag cgtgtttggc ctgccgctgc cgggctttct gcatctgacc      540
tgcccgcatc attggcggtt tggcgaagaa ggcgaaaccg aagaacagtt tgcgcgcgt      600
ctggcccgtg aactggaaga aaccattcag aagggaaggcg cggataccat tgcgggcttt      660
tttgcggaac cgggtgatggg tgctggcggg gttattacgc cggcgaaagg ctattttcag      720
gcgattctgc cgatcctgcg caaatatgat attccggtga tcagcgatga agtgatttgc      780
ggctttggcc gtaccggtaa cacctggggc tgcgtgacct atgattttac cccggatgcg      840
attattagca gtaaaaacct aaccgcgggt ttttttccgg taggcgcggg gattctgggt      900
ccggaactga gcaaacgtct ggaaaccgcg attgaagcga tcggcgaatt tccgcatggt      960
tttaccgcgg gcggccatcc ggtgggttgt gcgattgcgc tgaaagcgat tgatgtggtg     1020
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aaacatattg cggaacgtcc gaacattggc gaatatcgtg gcattggctt tatgtgggcg     1140
ctggaagcgg tgaaagataa agcgagcaaa gccccgtttg atggcaacct gagcgtgagc     1200
gaacgtattg cgaacacctg caccgatctg ggcctgattt gccgtccgac aggccagagc     1260
gtggttctgt gcccgcggtt tattctgacc gaagcgcaga tggatgaaat gttcgataaa     1320
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<210> 128
<211> 453
<212> PRT
<213> Artificial Sequence

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<220>
<223> Engineered variant of V. fluvialis transaminase

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<400> 128

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Met Asn Lys Pro Gln Ser Trp Glu Thr Arg Ala Glu Thr Tyr Ser Leu
1           5           10           15

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Tyr Gly Phe Thr Asp Met Pro Ser Leu His Gln Arg Gly Thr Val Val
          20          25          30

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Val Ala His Gly Glu Gly Pro Tyr Ile Val Asp Val His Gly Arg Arg
          35          40          45

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CX2-126USP1_ST25

Tyr Leu Asp Ala Asn Ser Gly Ala Leu Asn Met Val Ala Gly Phe Asp
 50 55 60
 His Lys Gly Leu Ile Asp Ala Ala Lys Ala Gln Tyr Glu Arg Phe Pro
 65 70 75 80
 Gly Tyr His Ala Phe Ser Gly His Met Ser Asp Gln Thr Val Met Leu
 85 90 95
 Ser Glu Lys Leu Val Glu Val Ser Pro Phe Asp Ser Gly Arg Val Phe
 100 105 110
 Tyr Thr Asn Ser Gly Ser Glu Ala Asn Asp Thr Met Val Lys Met Leu
 115 120 125
 Trp Phe Leu His Ala Ala Glu Gly Lys Pro Gln Lys Arg Lys Ile Leu
 130 135 140
 Thr Arg Trp Asn Ala Tyr His Gly Cys Thr Val Val Ser Ala Ser Met
 145 150 155 160
 Thr Gly Phe Pro Tyr Asn Ser Val Phe Gly Leu Pro Leu Pro Gly Phe
 165 170 175
 Leu His Leu Thr Cys Pro His Tyr Trp Arg Tyr Gly Glu Glu Gly Glu
 180 185 190
 Thr Glu Glu Gln Phe Val Ala Arg Leu Ala Arg Glu Leu Glu Glu Thr
 195 200 205
 Ile Gln Lys Glu Gly Ala Asp Thr Ile Ala Gly Phe Phe Ala Glu Pro
 210 215 220
 Val Met Gly Ala Gly Gly Val Ile Thr Pro Ala Lys Gly Tyr Phe Gln
 225 230 235 240
 Ala Ile Leu Pro Ile Leu Arg Lys Tyr Asp Ile Pro Val Ile Ser Asp
 245 250 255
 Glu Val Ile Cys Gly Phe Gly Arg Thr Gly Asn Thr Trp Gly Cys Val
 260 265 270
 Thr Tyr Asp Phe Thr Pro Asp Ala Ile Ile Ser Ser Lys Asn Leu Thr
 275 280 285
 Ala Gly Phe Phe Pro Val Gly Ala Val Ile Leu Gly Pro Glu Leu Ser
 290 295 300
 Lys Arg Leu Glu Thr Ala Ile Glu Ala Ile Gly Glu Phe Pro His Gly
 305 310 315 320

CX2-126USP1_ST25

Phe Thr Ala Gly Gly His Pro Val Gly Cys Ala Ile Ala Leu Lys Ala
325 330 335

Ile Asp Val Val Met Asn Glu Gly Leu Ala Glu Asn Val Arg Arg Leu
340 345 350

Ala Pro Arg Phe Glu Glu Arg Leu Lys His Ile Ala Glu Arg Pro Asn
355 360 365

Ile Gly Glu Tyr Arg Gly Ile Gly Phe Met Trp Ala Leu Glu Ala Val
370 375 380

Lys Asp Lys Ala Ser Lys Ala Pro Phe Asp Gly Asn Leu Ser Val Ser
385 390 395 400

Glu Arg Ile Ala Asn Thr Cys Thr Asp Leu Gly Leu Ile Cys Arg Pro
405 410 415

Thr Gly Gln Ser Val Val Leu Cys Pro Pro Phe Ile Leu Thr Glu Ala
420 425 430

Gln Met Asp Glu Met Phe Asp Lys Leu Glu Lys Ala Leu Asp Lys Val
435 440 445

Phe Ala Glu Val Ala
450

<210> 129
<211> 1359
<212> DNA
<213> Artificial Sequence

<220>
<223> Engineered variant of V. fluvialis transaminase

<400> 129	
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atcgtggatg tgcattgccc tcgttatctg gatgcgaaca gcggcgcttt gaacatggtg	180
gcgggctttg atcataaagg cctgattgat gcggcgaaaag cgcagtatga acgttttccg	240
ggctatcatg cgttttcagg ccatatgagc gatcagaccg tgatgctgtc tgaaaaactg	300
gtggaagtga gcccgtttga tagcggccgt gtgttttata ccaacagcgg cagcgaagcg	360
aacgatacca tggtgaaaat gctgtggttt ctgcatgcgg cggaaggcaa accgcagaaa	420
cgtaaaattc tgaccggttg gaacgcgtat catggctgta ccgtagtgag cgcgagcatg	480
accggctttc cgtataacag cgtgtttggc ctgccgctgc cgggctttct gcatctgacc	540
tgcccgcatt attggcggtta tggcgaagaa ggcgaaaccg aagaacagtt tgtcgcgcgt	600
ctggcccgtg aactggaaga aaccattcag aaggaaaggcg cgataccat tgcgggcttt	660

CX2-126USP1_ST25

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tttgcggaac cggatgatggg tgctggcggg gttattccgc cggcgaaagg ctattttcag      720
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ggcttttgcc gtaccggtaa cacctggggc tgcgtgacct atgattttac cccggatgcg      840
attattagca gtaaaaacct aaccgcgggt ttttttccgg taggcgcggg gattctgggt      900
ccggaactga gcaaactgtc ggaaaccgcg attgaagcga tcggcgaatt tccgcatggt      960
tttaccgcgg gcggccatcc ggtgggttgt gcgattgcgc tgaaagcgat tgatgtgggt     1020
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aaacatatat cggaactgcc gaacattggc gaatatcgtg gcattggctt tatgtgggcg      1140
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gaacgtattg cgaacacctg caccgatctg ggcctgattt gccgtccgac aggccagagc      1260
gtggttctgt gcccgccgtt tattctgacc gaagcgcaga tggatgaaat gttcgataaa      1320
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<210> 130
 <211> 453
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> Engineered variant of V. fluvialis transaminase
 <400> 130

Met Asn Lys Pro Gln Ser Trp Glu Thr Arg Ala Glu Thr Tyr Ser Leu
 1 5 10 15

Tyr Gly Phe Thr Asp Met Pro Ser Leu His Gln Arg Gly Thr Val Val
 20 25 30

Val Ala His Gly Glu Gly Pro Tyr Ile Val Asp Val His Gly Arg Arg
 35 40 45

Tyr Leu Asp Ala Asn Ser Gly Ala Leu Asn Met Val Ala Gly Phe Asp
 50 55 60

His Lys Gly Leu Ile Asp Ala Ala Lys Ala Gln Tyr Glu Arg Phe Pro
 65 70 75 80

Gly Tyr His Ala Phe Ser Gly His Met Ser Asp Gln Thr Val Met Leu
 85 90 95

Ser Glu Lys Leu Val Glu Val Ser Pro Phe Asp Ser Gly Arg Val Phe
 100 105 110

Tyr Thr Asn Ser Gly Ser Glu Ala Asn Asp Thr Met Val Lys Met Leu
 115 120 125

CX2-126USP1_ST25

Trp Phe Leu His Ala Ala Glu Gly Lys Pro Gln Lys Arg Lys Ile Leu
130 135 140

Thr Arg Trp Asn Ala Tyr His Gly Cys Thr Val Val Ser Ala Ser Met
145 150 155 160

Thr Gly Phe Pro Tyr Asn Ser Val Phe Gly Leu Pro Leu Pro Gly Phe
165 170 175

Leu His Leu Thr Cys Pro His Tyr Trp Arg Tyr Gly Glu Glu Gly Glu
180 185 190

Thr Glu Glu Gln Phe Val Ala Arg Leu Ala Arg Glu Leu Glu Glu Thr
195 200 205

Ile Gln Lys Glu Gly Ala Asp Thr Ile Ala Gly Phe Phe Ala Glu Pro
210 215 220

Val Met Gly Ala Gly Gly Val Ile Pro Pro Ala Lys Gly Tyr Phe Gln
225 230 235 240

Ala Ile Leu Pro Ile Leu Arg Lys Tyr Asp Ile Pro Val Ile Ser Asp
245 250 255

Glu Val Ile Cys Gly Phe Gly Arg Thr Gly Asn Thr Trp Gly Cys Val
260 265 270

Thr Tyr Asp Phe Thr Pro Asp Ala Ile Ile Ser Ser Lys Asn Leu Thr
275 280 285

Ala Gly Phe Phe Pro Val Gly Ala Val Ile Leu Gly Pro Glu Leu Ser
290 295 300

Lys Arg Leu Glu Thr Ala Ile Glu Ala Ile Gly Glu Phe Pro His Gly
305 310 315 320

Phe Thr Ala Gly Gly His Pro Val Gly Cys Ala Ile Ala Leu Lys Ala
325 330 335

Ile Asp Val Val Met Asn Glu Gly Leu Ala Glu Asn Val Arg Arg Leu
340 345 350

Ala Pro Arg Phe Glu Glu Arg Leu Lys His Ile Ala Glu Arg Pro Asn
355 360 365

Ile Gly Glu Tyr Arg Gly Ile Gly Phe Met Trp Ala Leu Glu Cys Val
370 375 380

Lys Asp Lys Ala Ser Lys Ala Pro Phe Asp Gly Asn Leu Ser Val Ser
385 390 395 400

CX2-126USP1_ST25

Glu Arg Ile Ala Asn Thr Cys Thr Asp Leu Gly Leu Ile Cys Arg Pro
405 410 415

Thr Gly Gln Ser Val Val Leu Cys Pro Pro Phe Ile Leu Thr Glu Ala
420 425 430

Gln Met Asp Glu Met Phe Asp Lys Leu Glu Lys Ala Leu Asp Lys Val
435 440 445

Phe Ala Glu Val Ala
450

<210> 131
<211> 1359
<212> DNA
<213> Artificial Sequence

<220>
<223> Engineered variant of V. fluvialis transaminase

<400> 131
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atcgtggatg tgcattggccg tcgttatctg gatgcgaaca gcggcgcttt gaacatgggtg 180
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gtggaagtga gcccgtttga tagcggccgt gtgttttata ccaacagcgg cagcgaagcg 360
aacgatacca tgggtgaaaat gctgtggttt ctgcatgcgg cggaaggcaa accgcagaaa 420
cgtaaaattc tgaccggtg gaacgcgtat catggctgta ccgtagtgag cgcgagcatg 480
accggctttc cgtataacag cgtgtttggc ctgccgctgc cgggctttct gcattctgacc 540
tgcccgcatt attggcggtt tggcgaagaa ggcgaaaccg aagaacagtt tgcgcgcgt 600
ctggcccgtg aactggaaga aaccattcag aagggaaggc cggataccat tgcgggcttt 660
tttgcggaac cgggtgatggg tgctggcggg gttattccgc cggcgaaagg ctattttcag 720
gcgattctgc cgatcctgcg caaatatgat attccgggtg tcagcgatga agtgatttgc 780
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gaacgtattg cgaacacctg caccgatctg ggcctgattt gccgtccgac aggccagagc 1260
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ctggaaaaag cgctggataa agtgtttgcg gaagtggcg

1359

<210> 132
 <211> 453
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> Engineered variant of V. fluvialis transaminase

<400> 132

Met Asn Lys Pro Gln Ser Trp Glu Thr Arg Ala Glu Thr Tyr Ser Leu
 1 5 10 15

Tyr Gly Phe Thr Asp Met Pro Ser Leu His Gln Arg Gly Thr Val Val
 20 25 30

Val Ala His Gly Glu Gly Pro Tyr Ile Val Asp Val His Gly Arg Arg
 35 40 45

Tyr Leu Asp Ala Asn Ser Gly Ala Leu Asn Met Val Ala Gly Phe Asp
 50 55 60

His Lys Gly Leu Ile Asp Ala Ala Lys Ala Gln Tyr Glu Arg Phe Pro
 65 70 75 80

Gly Tyr His Ala Phe Ser Gly His Met Ser Asp Gln Thr Val Met Leu
 85 90 95

Ser Glu Lys Leu Val Glu Val Ser Pro Phe Asp Ser Gly Arg Val Phe
 100 105 110

Tyr Thr Asn Ser Gly Ser Glu Ala Asn Asp Thr Met Val Lys Met Leu
 115 120 125

Trp Phe Leu His Ala Ala Glu Gly Lys Pro Gln Lys Arg Lys Ile Leu
 130 135 140

Thr Arg Trp Asn Ala Tyr His Gly Cys Thr Val Val Ser Ala Ser Met
 145 150 155 160

Thr Gly Phe Pro Tyr Asn Ser Val Phe Gly Leu Pro Leu Pro Gly Phe
 165 170 175

Leu His Leu Thr Cys Pro His Tyr Trp Arg Tyr Gly Glu Glu Gly Glu
 180 185 190

Thr Glu Glu Gln Phe Val Ala Arg Leu Ala Arg Glu Leu Glu Glu Thr
 195 200 205

Ile Gln Lys Glu Gly Ala Asp Thr Ile Ala Gly Phe Phe Ala Glu Pro
 210 215 220

CX2-126USP1_ST25

Val Met Gly Ala Gly Gly Val Ile Pro Pro Ala Lys Gly Tyr Phe Gln
225 230 235 240

Ala Ile Leu Pro Ile Leu Arg Lys Tyr Asp Ile Pro Val Ile Ser Asp
245 250 255

Glu Val Ile Cys Gly Phe Gly Arg Thr Gly Asn Thr Trp Gly Cys Val
260 265 270

Thr Tyr Asp Phe Thr Pro Asp Ala Ile Ile Ser Ser Lys Asn Leu Thr
275 280 285

Ala Gly Phe Phe Pro Val Gly Ala Val Ile Leu Gly Pro Glu Leu Ser
290 295 300

Lys Arg Leu Glu Thr Ala Ile Glu Ala Ile Gly Glu Phe Pro His Gly
305 310 315 320

Phe Thr Ala Gly Gly His Pro Val Gly Cys Ala Ile Ala Leu Lys Ala
325 330 335

Ile Asp Val Val Met Asn Glu Gly Leu Ala Glu Asn Val Arg Arg Leu
340 345 350

Ala Pro Arg Phe Glu Glu Arg Leu Lys His Ile Ala Glu Arg Pro Asn
355 360 365

Ile Gly Glu Tyr Arg Gly Ile Gly Phe Met Trp Ala Leu Glu Ile Val
370 375 380

Lys Asp Lys Ala Ser Lys Ala Pro Phe Asp Gly Asn Leu Ser Val Ser
385 390 395 400

Glu Arg Ile Ala Asn Thr Cys Thr Asp Leu Gly Leu Ile Cys Arg Pro
405 410 415

Thr Gly Gln Ser Val Val Leu Cys Pro Pro Phe Ile Leu Thr Glu Ala
420 425 430

Gln Met Asp Glu Met Phe Asp Lys Leu Glu Lys Ala Leu Asp Lys Val
435 440 445

Phe Ala Glu Val Ala
450

<210> 133
<211> 1359
<212> DNA
<213> Artificial Sequence

<220>

CX2-126USP1_ST25

<223> Engineered variant of *V. fluvialis* transaminase

<400> 133

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atcgtggatg tgcattggcg tcgttatctg gatgcgaaca gcggcgcttt gaacatggtg      180
gcgggctttg atcataaagg cctgattgat gcggcgaaa gcgagatga acgttttccg      240
ggctatcatg cgttttcagg ccataatgag gatcagaccg tgatgctgtc tgaaaaactg      300
gtggaagtga gcccgtttga tagcggccgt gtgttttata ccaacagcgg cagcgaagcg      360
aacgatacca tgggtgaaaat gctgtggttt ctgcatgcgg cggaaggcaa accgcagaaa      420
cgtaaaattc tgaccggttg gaacgcgtat catggctgta ccgcagtga cgcgagcatg      480
accggctttc cgtataacag cgtgtttggc ctgccgctgc cgggctttct gcatctgacc      540
tgccgcatt attggcgta tggcgaagaa ggcgaaaccg aagaacagtt tgtcgcgcgt      600
ctggcccgtg aactggaaga aaccattcag aagggaaggcg cggataccat tgcgggcttt      660
tttgcggaac cggatgatgg tgctggcggg gttattccgc cggcgaaagg ctattttcag      720
gcgattctgc cgatcctgcg caaatatgat attccggtga tcagcgatga agtgatttgc      780
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aaacatattg cggaacgtcc gaacattggc gaatatctg gcattggctt tatgtgggcg     1140
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gaacgtattg cgaacacctg caccgatctg ggcctgattt gccgtccgac aggccagagc     1260
gtggttctgt gcccgcggtt tattctgacc gaagcgaga tggatgaaat gttcgataaa     1320
ctggaaaaag cgctggataa agtgtttagt gaagtggcg                                1359

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<210> 134

<211> 453

<212> PRT

<213> Artificial Sequence

<220>

<223> Engineered variant of *V. fluvialis* transaminase

<400> 134

Met Asn Lys Pro Gln Ser Trp Glu Thr Arg Ala Glu Thr Tyr Ser Leu
1 5 10 15

Tyr Gly Phe Thr Asp Met Pro Ser Leu His Gln Arg Gly Thr Val Val
20 25 30

Val Ala His Gly Glu Gly Pro Tyr Ile Val Asp Val His Gly Arg Arg
 35 40 45
 Tyr Leu Asp Ala Asn Ser Gly Ala Leu Asn Met Val Ala Gly Phe Asp
 50 55 60
 His Lys Gly Leu Ile Asp Ala Ala Lys Ala Gln Tyr Glu Arg Phe Pro
 65 70 75 80
 Gly Tyr His Ala Phe Ser Gly His Met Ser Asp Gln Thr Val Met Leu
 85 90 95
 Ser Glu Lys Leu Val Glu Val Ser Pro Phe Asp Ser Gly Arg Val Phe
 100 105 110
 Tyr Thr Asn Ser Gly Ser Glu Ala Asn Asp Thr Met Val Lys Met Leu
 115 120 125
 Trp Phe Leu His Ala Ala Glu Gly Lys Pro Gln Lys Arg Lys Ile Leu
 130 135 140
 Thr Arg Trp Asn Ala Tyr His Gly Cys Thr Ala Val Ser Ala Ser Met
 145 150 155 160
 Thr Gly Phe Pro Tyr Asn Ser Val Phe Gly Leu Pro Leu Pro Gly Phe
 165 170 175
 Leu His Leu Thr Cys Pro His Tyr Trp Arg Tyr Gly Glu Glu Gly Glu
 180 185 190
 Thr Glu Glu Gln Phe Val Ala Arg Leu Ala Arg Glu Leu Glu Glu Thr
 195 200 205
 Ile Gln Lys Glu Gly Ala Asp Thr Ile Ala Gly Phe Phe Ala Glu Pro
 210 215 220
 Val Met Gly Ala Gly Gly Val Ile Pro Pro Ala Lys Gly Tyr Phe Gln
 225 230 235 240
 Ala Ile Leu Pro Ile Leu Arg Lys Tyr Asp Ile Pro Val Ile Ser Asp
 245 250 255
 Glu Val Ile Cys Gly Phe Gly Arg Thr Gly Asn Thr Trp Gly Cys Val
 260 265 270
 Thr Tyr Asp Phe Thr Pro Asp Ala Ile Ile Ser Ser Lys Asn Leu Thr
 275 280 285
 Ala Gly Phe Phe Pro Val Gly Ala Val Ile Leu Gly Pro Glu Leu Ser
 290 295 300

CX2-126USP1_ST25

Lys Arg Leu Glu Thr Ala Ile Glu Ala Ile Gly Glu Phe Pro His Gly
305 310 315 320

Phe Thr Ala Gly Gly His Pro Val Gly Cys Ala Ile Ala Leu Lys Ala
325 330 335

Ile Asp Val Val Met Asn Glu Gly Leu Ala Glu Asn Val Arg Arg Leu
340 345 350

Ala Pro Arg Phe Glu Glu Arg Leu Lys His Ile Ala Glu Arg Pro Asn
355 360 365

Ile Gly Glu Tyr Arg Gly Ile Gly Phe Met Trp Ala Leu Glu Ala Val
370 375 380

Lys Asp Lys Ala Ser Lys Ala Pro Phe Asp Gly Asn Leu Ser Val Ser
385 390 395 400

Glu Arg Ile Ala Asn Thr Cys Thr Asp Leu Gly Leu Ile Cys Arg Pro
405 410 415

Thr Gly Gln Ser Val Val Leu Cys Pro Pro Phe Ile Leu Thr Glu Ala
420 425 430

Gln Met Asp Glu Met Phe Asp Lys Leu Glu Lys Ala Leu Asp Lys Val
435 440 445

Phe Ser Glu Val Ala
450

- <210> 135
- <211> 1359
- <212> DNA
- <213> Artificial sequence

<220>
<223> Engineered variant of v. fluvialis transaminase

<400> 135
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atcgtggatg tgcattggcg tcgttatctg gatgcgaaca gcggcgcttt gaacatggtg 180
gcgggctttg atcataaagg cctgattgat gcggcgaaag cgcagtatga acgtttttccg 240
ggctatcatg cgttttcagg ccatatgagc gatcagaccg tgatgctgtc tgaaaaactg 300
gtggaagtga gcccgtttga tagcggccgt gtgttttata ccaacagcgg cagcgaagcg 360
aacgatacca tgggtgaaaat gctgtggttt ctgcatgcgg cggaaggcaa accgcagaaa 420
cgtaaaattc tgacccgttg gaacgcgtat catggctgta ccgtagtgag cgcgagcatg 480
accggctttc cgtataacag cgtgtttggc ctgccgctgc cgggctttct gcatctgacc 540
tgcccgcatt attggcggtta tggcgaagaa ggcgaaaccg aagaacagtt tgtcgcgcgt 600

CX2-126USP1_ST25

ctggcccgtg aactgaagga aaccattcag aaggaaggcg cggataccat tgcgggcttt 660
 ttgcggaac cggatgatggg tgctggcggg gttattccgc cggcgaaagg ctattttcag 720
 gcgattctgc cgatcctgcg caaatatgat attccgggtga tcagcgatga agtgatttgc 780
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 attattagca gtaaaaacct aaccgcgggt ttttttccgg taggcgcggg gattctgggt 900
 ccggaactga gcaaactgtt ggaaaccgcg attgaagcga tcggcgcat tccgcatggt 960
 ttaccgcgg gcggccatcc ggtgggttgt gcgattgcgc tgaaagcgat tgatgtggtg 1020
 atgaacgaag gcctggccga aaacgtgcgt cgtctggccc cgcgttttga agaactgtctg 1080
 aaacatattg cggaactgcc gaacattggc gaatatcgtg gcattggctt tatgtgggctg 1140
 ctggaagcgg tgaaagataa agcgagcaaa gccccgtttg atggcaacct gagcgtgagc 1200
 gaacgtattg cgaacacctg caccgatctg ggcttgattt gccgtccgac aggccagagc 1260
 gtggttctgt gcccgcggtt tattctgacc gaagcgcaga tggatgaaat gttcgataaa 1320
 ctggaaaaag cgctggataa agtgtttgcg gaagtggcg 1359

<210> 136

<211> 453

<212> PRT

<213> Artificial Sequence

<220>

<223> Engineered variant of V. fluvialis transaminase

<400> 136

Met Asn Lys Pro Gln Ser Trp Glu Thr Arg Ala Glu Thr Tyr Ser Leu
 1 5 10 15

Tyr Gly Phe Thr Asp Met Pro Ser Leu His Gln Arg Gly Thr Val Val
 20 25 30

Val Ala His Gly Glu Gly Pro Tyr Ile Val Asp Val His Gly Arg Arg
 35 40 45

Tyr Leu Asp Ala Asn Ser Gly Ala Leu Asn Met Val Ala Gly Phe Asp
 50 55 60

His Lys Gly Leu Ile Asp Ala Ala Lys Ala Gln Tyr Glu Arg Phe Pro
 65 70 75 80

Gly Tyr His Ala Phe Ser Gly His Met Ser Asp Gln Thr Val Met Leu
 85 90 95

Ser Glu Lys Leu Val Glu Val Ser Pro Phe Asp Ser Gly Arg Val Phe
 100 105 110

Tyr Thr Asn Ser Gly Ser Glu Ala Asn Asp Thr Met Val Lys Met Leu
 115 120 125

CX2-126USP1_ST25

Trp Phe Leu His Ala Ala Glu Gly Lys Pro Gln Lys Arg Lys Ile Leu
 130 135 140
 Thr Arg Trp Asn Ala Tyr His Gly Cys Thr Val Val Ser Ala Ser Met
 145 150 155 160
 Thr Gly Phe Pro Tyr Asn Ser Val Phe Gly Leu Pro Leu Pro Gly Phe
 165 170 175
 Leu His Leu Thr Cys Pro His Tyr Trp Arg Tyr Gly Glu Glu Gly Glu
 180 185 190
 Thr Glu Glu Gln Phe Val Ala Arg Leu Ala Arg Glu Leu Lys Glu Thr
 195 200 205
 Ile Gln Lys Glu Gly Ala Asp Thr Ile Ala Gly Phe Phe Ala Glu Pro
 210 215 220
 Val Met Gly Ala Gly Gly Val Ile Pro Pro Ala Lys Gly Tyr Phe Gln
 225 230 235 240
 Ala Ile Leu Pro Ile Leu Arg Lys Tyr Asp Ile Pro Val Ile Ser Asp
 245 250 255
 Glu Val Ile Cys Gly Phe Gly Arg Thr Gly Asn Thr Trp Gly Cys Val
 260 265 270
 Thr Tyr Asp Phe Thr Pro Asp Ala Ile Ile Ser Ser Lys Asn Leu Thr
 275 280 285
 Ala Gly Phe Phe Pro Val Gly Ala Val Ile Leu Gly Pro Glu Leu Ser
 290 295 300
 Lys Arg Leu Glu Thr Ala Ile Glu Ala Ile Gly Ala Phe Pro His Gly
 305 310 315 320
 Phe Thr Ala Gly Gly His Pro Val Gly Cys Ala Ile Ala Leu Lys Ala
 325 330 335
 Ile Asp Val Val Met Asn Glu Gly Leu Ala Glu Asn Val Arg Arg Leu
 340 345 350
 Ala Pro Arg Phe Glu Glu Arg Leu Lys His Ile Ala Glu Arg Pro Asn
 355 360 365
 Ile Gly Glu Tyr Arg Gly Ile Gly Phe Met Trp Ala Leu Glu Ala Val
 370 375 380
 Lys Asp Lys Ala Ser Lys Ala Pro Phe Asp Gly Asn Leu Ser Val Ser
 385 390 395 400

CX2-126USP1_ST25

Glu Arg Ile Ala Asn Thr Cys Thr Asp Leu Gly Leu Ile Cys Arg Pro
405 410 415

Thr Gly Gln Ser Val Val Leu Cys Pro Pro Phe Ile Leu Thr Glu Ala
420 425 430

Gln Met Asp Glu Met Phe Asp Lys Leu Glu Lys Ala Leu Asp Lys Val
435 440 445

Phe Ala Glu Val Ala
450

<210> 137
<211> 1359
<212> DNA
<213> Artificial Sequence

<220>
<223> Engineered variant of V. fluvialis transaminase

<400> 137
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atcgtggatg tgcattggcg tcgttatctg gatgcgaaca gcggcgcttt gaacatggtg 180
gcgggctttg atcataaagg cctgattgat gcggcgaaag cgcagtatga acgttttccg 240
ggctatcatg cgttttcagg ccatatgagc gatcagaccg tgatgctgtc tgaaaaactg 300
gtggaagtga gcccgtttga tagcggccgt gtgttttata ccaacagcgg cagcgaagcg 360
aacgatacca tgggtgaaaat gctgtggttt ctgcatgcgg cggaaggcaa accgcagaaa 420
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accggctttc cgtataacag cgtgtttggc ctgccgctgc cgggctttct gcatctgacc 540
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ctggcccgtg aactggaaga aaccattcag aagggaaggcg cggataccat tgcgggcttt 660
tttgcggaac cggatgatgg tgctggcggg gttattccgc cggcgaaagg ctattttcag 720
gcgattctgc cgatcctgcg caaatatgat attccggtga tcagcgatga agtgatttgc 780
ggctttggcc gtaccggtaa cacctggggc tgcgtgacct atgattttac cccggatgcg 840
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ctggaatttg tgaaagataa agcgagcaaa gccccgtttg atggcaacct gagcgtgagc 1200
gaacgtattg cgaacacctg caccgatctg ggctgtattt gccgtccgac aggccagagc 1260

CX2-126USP1_ST25

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ctggaaaaag cgctggataa agtgtttgcg gaagtggcg 1359

<210> 138
<211> 453
<212> PRT
<213> Artificial Sequence

<220>
<223> Engineered variant of V. fluvialis transaminase
<400> 138

Met Asn Lys Pro Gln Ser Trp Glu Thr Arg Ala Glu Thr Tyr Ser Leu
1 5 10 15

Tyr Gly Phe Thr Asp Met Pro Ser Leu His Gln Arg Gly Thr Val Val
20 25 30

Val Ala His Gly Glu Gly Pro Tyr Ile Val Asp Val His Gly Arg Arg
35 40 45

Tyr Leu Asp Ala Asn Ser Gly Ala Leu Asn Met Val Ala Gly Phe Asp
50 55 60

His Lys Gly Leu Ile Asp Ala Ala Lys Ala Gln Tyr Glu Arg Phe Pro
65 70 75 80

Gly Tyr His Ala Phe Ser Gly His Met Ser Asp Gln Thr Val Met Leu
85 90 95

Ser Glu Lys Leu Val Glu Val Ser Pro Phe Asp Ser Gly Arg Val Phe
100 105 110

Tyr Thr Asn Ser Gly Ser Glu Ala Asn Asp Thr Met Val Lys Met Leu
115 120 125

Trp Phe Leu His Ala Ala Glu Gly Lys Pro Gln Lys Arg Lys Ile Leu
130 135 140

Thr Arg Trp Asn Ala Tyr His Gly Cys Thr Val Val Ser Ala Ser Met
145 150 155 160

Thr Gly Phe Pro Tyr Asn Ser Val Phe Gly Leu Pro Leu Pro Gly Phe
165 170 175

Leu His Leu Thr Cys Pro His Tyr Trp Arg Tyr Gly Glu Glu Gly Glu
180 185 190

Thr Glu Glu Gln Phe Val Ala Arg Leu Ala Arg Glu Leu Glu Glu Thr
195 200 205

CX2-126USP1_ST25

Ile Gln Lys Glu Gly Ala Asp Thr Ile Ala Gly Phe Phe Ala Glu Pro
210 215 220

Val Met Gly Ala Gly Gly Val Ile Pro Pro Ala Lys Gly Tyr Phe Gln
225 230 235 240

Ala Ile Leu Pro Ile Leu Arg Lys Tyr Asp Ile Pro Val Ile Ser Asp
245 250 255

Glu Val Ile Cys Gly Phe Gly Arg Thr Gly Asn Thr Trp Gly Cys Val
260 265 270

Thr Tyr Asp Phe Thr Pro Asp Ala Ile Ile Ser Ser Lys Asn Leu Thr
275 280 285

Ala Gly Phe Phe Pro Val Gly Ala Val Ile Leu Gly Pro Glu Leu Ser
290 295 300

Lys Arg Leu Glu Thr Ala Ile Glu Ala Ile Gly Glu Phe Pro His Gly
305 310 315 320

Phe Thr Ala Gly Gly His Pro Val Gly Cys Ala Ile Ala Leu Lys Ala
325 330 335

Ile Asp Val Val Met Asn Glu Gly Leu Ala Glu Asn Val Arg Arg Leu
340 345 350

Ala Pro Arg Phe Glu Glu Arg Leu Lys His Ile Ala Glu Arg Pro Asn
355 360 365

Ile Gly Glu Tyr Arg Gly Ile Gly Phe Met Trp Ala Leu Glu Phe Val
370 375 380

Lys Asp Lys Ala Ser Lys Ala Pro Phe Asp Gly Asn Leu Ser Val Ser
385 390 395 400

Glu Arg Ile Ala Asn Thr Cys Thr Asp Leu Gly Leu Ile Cys Arg Pro
405 410 415

Thr Gly Gln Ser Val Val Leu Cys Pro Pro Phe Ile Leu Thr Glu Ala
420 425 430

Gln Met Asp Glu Met Phe Asp Lys Leu Glu Lys Ala Leu Asp Lys Val
435 440 445

Phe Ala Glu Val Ala
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<210> 139
<211> 1359
<212> DNA
<213> Artificial Sequence

CX2-126USP1_ST25

<220>

<223> Engineered variant of V. fluvialis transaminase

<400> 139

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gcgggctttg atcataaagg cctgattgat gcggcgaaag cgcagtatga acgttttccg	240
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tgcccgcatt attggcggtt tggcgaagaa ggcgaaaccg aagaacagtt tgtcgcgcgt	600
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gaacgtattg cgaacacctg caccgatctg ggctgattt gccgtccgac aggccagagc	1260
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ctggaaaaag cgctggataa agtggtttgcg gaagtggcg	1359

<210> 140

<211> 453

<212> PRT

<213> Artificial Sequence

<220>

<223> Engineered variant of V. fluvialis transaminase

<400> 140

Met	Asn	Lys	Pro	Gln	Ser	Trp	Glu	Thr	Arg	Ala	Glu	Thr	Tyr	Ser	Leu
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Tyr	Gly	Phe	Thr	Asp	Met	Pro	Ser	Leu	His	Gln	Arg	Gly	Thr	Val	Val
			20					25					30		

CX2-126USP1_ST25

Val Ala His Gly Glu Gly Pro Tyr Ile Val Asp Val His Gly Arg Arg
 35 40 45
 Tyr Leu Asp Ala Asn Ser Gly Ala Leu Asn Met Val Ala Gly Phe Asp
 50 55 60
 His Lys Gly Leu Ile Asp Ala Ala Lys Ala Gln Tyr Glu Arg Phe Pro
 65 70 75 80
 Gly Tyr His Ala Phe Ser Gly His Met Ser Asp Gln Thr Val Met Leu
 85 90 95
 Ser Glu Lys Leu Val Glu Val Ser Pro Phe Asp Ser Gly Arg Val Phe
 100 105 110
 Tyr Thr Asn Ser Gly Ser Glu Ala Asn Asp Thr Met Val Lys Met Leu
 115 120 125
 Trp Phe Leu His Ala Ala Glu Gly Lys Pro Gln Lys Arg Lys Ile Leu
 130 135 140
 Thr Arg Trp Asn Ala Tyr His Gly Cys Thr Val Val Ser Ala Ser Met
 145 150 155 160
 Thr Gly Phe Pro Tyr Asn Ser Val Phe Gly Leu Pro Leu Pro Gly Phe
 165 170 175
 Leu His Leu Thr Cys Pro His Tyr Trp Arg Tyr Gly Glu Glu Gly Glu
 180 185 190
 Thr Glu Glu Gln Phe Val Ala Arg Leu Ala Arg Glu Leu Glu Glu Thr
 195 200 205
 Ile Gln Lys Glu Gly Ala Asp Thr Ile Ala Gly Phe Phe Ala Glu Pro
 210 215 220
 Val Met Gly Ala Gly Gly Val Ile Pro Pro Ala Lys Gly Tyr Phe Gln
 225 230 235 240
 Ala Ile Leu Pro Ile Leu Arg Lys Tyr Asp Ile Pro Val Ile Ser Asp
 245 250 255
 Glu Val Ile Cys Gly Phe Gly Arg Thr Gly Asn Thr Trp Gly Cys Val
 260 265 270
 Thr Tyr Asp Phe Thr Pro Asp Ala Ile Ile Ser Ser Lys Asn Leu Thr
 275 280 285
 Ala Gly Phe Phe Pro Val Gly Ala Val Ile Leu Gly Pro Glu Leu Ser
 290 295 300

CX2-126USP1_ST25

Lys Arg Leu Glu Thr Ala Ile Glu Ala Ile Gly Glu Phe Pro His Gly
305 310 315 320

Phe Thr Ala Gly Gly His Pro Val Gly Cys Ala Ile Ala Leu Lys Ala
325 330 335

Ile Asp Val Val Met Asn Glu Gly Leu Ala Glu Asn Val Arg Arg Leu
340 345 350

Ala Pro Arg Phe Glu Glu Arg Leu Lys His Ile Ala Glu Arg Pro Asn
355 360 365

Ile Gly Glu Tyr Arg Gly Ile Gly Phe Met Trp Ala Leu Glu Met Val
370 375 380

Lys Asp Lys Ala Ser Lys Ala Pro Phe Asp Gly Asn Leu Ser Val Ser
385 390 395 400

Glu Arg Ile Ala Asn Thr Cys Thr Asp Leu Gly Leu Ile Cys Arg Pro
405 410 415

Thr Gly Gln Ser Val Val Leu Cys Pro Pro Phe Ile Leu Thr Glu Ala
420 425 430

Gln Met Asp Glu Met Phe Asp Lys Leu Glu Lys Ala Leu Asp Lys Val
435 440 445

Phe Ala Glu Val Ala
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<210> 141
<211> 1359
<212> DNA
<213> Artificial Sequence

<220>
<223> Engineered variant of V. fluvialis transaminase

<400> 141
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atcgtggatg tgcattggccg tcgttatctg gatgcgaaca gcggcgcttt gaacatggtg 180
gcgggctttg atcataaagg cctgattgat gcggcgaaag cgcagtatga acgttttccg 240
ggctatcatg cgttttcagg ccatatgagc gatcagaccg tgatgctgtc tgaaaaactg 300
gtggaagtga gcccgtttga tagcggccgt gtgttttata ccaacagcgg cagcgaagcg 360
aacgatacca tgggtgaaaat gctgtggttt ctgcatgcgg cggaaggcaa accgcagaaa 420
cgtaaaattc tgaccggttg gaacgcgtat catggctgta ccgtagtgag cgcgagcatg 480
accggctttc cgtataacag cgtgtttggc ctgccgctgc cgggctttct gcatctgacc 540

CX2-126USP1_ST25

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tttgcgga	ac	cggtgat	ggg	tgctgg	cgt	gttatt	ccgc	cggcgaa	agg	ctatt	tttcag			720
g	cgattctgc	cgatcctgc	g	caaata	tgat	attccg	gtga	tcagc	gatga	agt	gatttgc			780
ggcttt	ggcc	gtaccg	gtaa	cacctg	ggggc	tg	cg	tgac	ct	atgatt	tttac	ccc	ggatgc	840
attattag	ca	gtaaaa	ac	ct	aaccgc	gggt	tttttt	ccg	g	taggcgc	ggt	gattct	gggt	900
ccgga	actga	gcaa	acgtct	ggaa	accgcg	attga	agcga	tcggc	gaatt	tccg	catggt			960
tttaccgc	gg	gcggcc	atcc	ggtg	gg	ttgt	gc	gattgcgc	tgaa	agc	gat	tgat	gtggtg	1020
atgaac	gaag	gcctg	gccga	aaac	gtgc	gt	cgtctg	gccc	cg	g	ttttga	aga	acgtctg	1080
aaacata	t	cgga	acgtcc	gaac	attggc	gaata	tcgtg	gcattg	g	c	tt	tatg	tg	1140
ctgga	agcgg	tgaa	agataa	agcg	agcaaa	gcccc	gtttg	atgg	caac	ct	gagc	gtgagc		1200
gaacgt	attg	cgaac	ac	ctg	cacc	gatctg	ggc	ctgatt	tt	gcc	gtccggt	tgg	ccagagc	1260
gtggt	ttctgt	gcccc	ccg	tt	tatt	ctgacc	gaag	cg	caga	tggat	gaaat	gttc	gataaa	1320
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<210> 142
 <211> 453
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> Engineered variant of V. fluvialis transaminase

<400> 142

Met	Asn	Lys	Pro	Gln	Ser	Trp	Glu	Thr	Arg	Ala	Glu	Thr	Tyr	Ser	Leu
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Tyr	Gly	Phe	Thr	Asp	Met	Pro	Ser	Leu	His	Gln	Arg	Gly	Thr	Val	Val
			20					25					30		

Val	Ala	His	Gly	Glu	Gly	Pro	Tyr	Ile	Val	Asp	Val	His	Gly	Arg	Arg
		35					40					45			

Tyr	Leu	Asp	Ala	Asn	Ser	Gly	Ala	Leu	Asn	Met	Val	Ala	Gly	Phe	Asp
	50					55					60				

His	Lys	Gly	Leu	Ile	Asp	Ala	Ala	Lys	Ala	Gln	Tyr	Glu	Arg	Phe	Pro
65					70					75					80

Gly	Tyr	His	Ala	Phe	Ser	Gly	His	Met	Ser	Asp	Gln	Thr	Val	Met	Leu
				85					90					95	

Ser	Glu	Lys	Leu	Val	Glu	Val	Ser	Pro	Phe	Asp	Ser	Gly	Arg	Val	Phe
			100					105					110		

Tyr Thr Asn Ser Gly Ser Glu Ala Asn Asp Thr Met Val Lys Met Leu
 115 120 125
 Trp Phe Leu His Ala Ala Glu Gly Lys Pro Gln Lys Arg Lys Ile Leu
 130 135 140
 Thr Arg Trp Asn Ala Tyr His Gly Cys Thr Val Val Ser Ala Ser Met
 145 150 155 160
 Thr Gly Phe Pro Tyr Asn Ser Val Phe Gly Leu Pro Leu Pro Gly Phe
 165 170 175
 Leu His Leu Thr Cys Pro His Tyr Trp Arg Tyr Gly Glu Glu Gly Glu
 180 185 190
 Thr Glu Glu Gln Phe Val Ala Arg Leu Ala Arg Glu Leu Glu Glu Thr
 195 200 205
 Ile Gln Lys Glu Gly Ala Asp Thr Ile Ala Gly Phe Phe Ala Glu Pro
 210 215 220
 Val Met Gly Ala Gly Gly Val Ile Pro Pro Ala Lys Gly Tyr Phe Gln
 225 230 235 240
 Ala Ile Leu Pro Ile Leu Arg Lys Tyr Asp Ile Pro Val Ile Ser Asp
 245 250 255
 Glu Val Ile Cys Gly Phe Gly Arg Thr Gly Asn Thr Trp Gly Cys Val
 260 265 270
 Thr Tyr Asp Phe Thr Pro Asp Ala Ile Ile Ser Ser Lys Asn Leu Thr
 275 280 285
 Ala Gly Phe Phe Pro Val Gly Ala Val Ile Leu Gly Pro Glu Leu Ser
 290 295 300
 Lys Arg Leu Glu Thr Ala Ile Glu Ala Ile Gly Glu Phe Pro His Gly
 305 310 315 320
 Phe Thr Ala Gly Gly His Pro Val Gly Cys Ala Ile Ala Leu Lys Ala
 325 330 335
 Ile Asp Val Val Met Asn Glu Gly Leu Ala Glu Asn Val Arg Arg Leu
 340 345 350
 Ala Pro Arg Phe Glu Glu Arg Leu Lys His Ile Ala Glu Arg Pro Asn
 355 360 365
 Ile Gly Glu Tyr Arg Gly Ile Gly Phe Met Trp Ala Leu Glu Ala Val
 370 375 380

CX2-126USP1_ST25

Lys Asp Lys Ala Ser Lys Ala Pro Phe Asp Gly Asn Leu Ser Val Ser
385 390 395 400

Glu Arg Ile Ala Asn Thr Cys Thr Asp Leu Gly Leu Ile Cys Arg Pro
405 410 415

Val Gly Gln Ser Val Val Leu Cys Pro Pro Phe Ile Leu Thr Glu Ala
420 425 430

Gln Met Asp Glu Met Phe Asp Lys Leu Glu Lys Ala Leu Asp Lys Val
435 440 445

Phe Ala Glu Val Ala
450

<210> 143
<211> 1359
<212> DNA
<213> Artificial Sequence

<220>
<223> Engineered variant of V. fluvialis transaminase

<400> 143
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accggctttc cgtataacag cgtgtttggc ctgccgctgc cgggctttct gcatctgacc 540
tgcccgcatc attggcggtt tggcgaagaa ggcgaaaccg aagaacagtt tgtcgcgcgt 600
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tttgcggaac cggatgatgg tgctggcggg gttattccgc cggcgaaagg ctattttcag 720
gcgattctgc cgatcctgcg caaatatgat attccggtga tcagcgatga agtgatttgc 780
ggctttggcc gtaccggtta cacctggggc tgcgtgacct atgattttac cccggatgcg 840
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CX2-126USP1_ST25

gaacgtattg cgaacacctg caccgatctg ggcctgattt gccgtccgac aggccagagc 1260
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ctggaaaaag cgctggataa agtgtttgcg gaagtggcg 1359

<210> 144
<211> 453
<212> PRT
<213> Artificial sequence

<220>
<223> Engineered variant of v. fluvialis transaminase

<400> 144

Met Asn Lys Pro Gln Ser Trp Glu Thr Arg Ala Glu Thr Tyr Ser Leu
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Tyr Gly Phe Thr Asp Met Pro Ser Leu His Gln Arg Gly Thr Val Val
20 25 30

Val Ala His Gly Glu Gly Pro Tyr Ile Val Asp Val His Gly Arg Arg
35 40 45

Tyr Leu Asp Ala Asn Ser Gly Ala Leu Asn Met Val Ala Gly Phe Asp
50 55 60

His Lys Gly Leu Ile Asp Ala Ala Arg Ala Gln Tyr Glu Arg Phe Pro
65 70 75 80

Gly Tyr His Ala Phe Ser Gly His Met Ser Asp Gln Thr Val Met Leu
85 90 95

Ser Glu Lys Leu Val Glu Val Ser Pro Phe Asp Ser Gly Arg Val Phe
100 105 110

Tyr Thr Asn Ser Gly Ser Glu Ala Asn Asp Thr Met Val Lys Met Leu
115 120 125

Trp Phe Leu His Ala Ala Glu Gly Lys Pro Gln Lys Arg Lys Ile Leu
130 135 140

Thr Arg Trp Asn Ala Tyr His Gly Cys Thr Val Val Ser Ala Ser Met
145 150 155 160

Thr Gly Phe Pro Tyr Asn Ser Val Phe Gly Leu Pro Leu Pro Gly Phe
165 170 175

Leu His Leu Thr Cys Pro His Tyr Trp Arg Tyr Gly Glu Glu Gly Glu
180 185 190

Thr Glu Glu Gln Phe Val Ala Arg Leu Ala Arg Glu Leu Glu Glu Thr
195 200 205

CX2-126USP1_ST25

Ile Gln Lys Glu Gly Ala Asp Thr Ile Ala Gly Phe Phe Ala Glu Pro
210 215 220

Val Met Gly Ala Gly Gly Val Ile Pro Pro Ala Lys Gly Tyr Phe Gln
225 230 235 240

Ala Ile Leu Pro Ile Leu Arg Lys Tyr Asp Ile Pro Val Ile Ser Asp
245 250 255

Glu Val Ile Cys Gly Phe Gly Arg Thr Gly Asn Thr Trp Gly Cys Val
260 265 270

Thr Tyr Asp Phe Thr Pro Asp Ala Ile Ile Ser Ser Lys Asn Leu Thr
275 280 285

Ala Gly Phe Phe Pro Val Gly Ala Val Ile Leu Gly Pro Glu Leu Ser
290 295 300

Lys Arg Leu Glu Thr Ala Ile Glu Ala Ile Gly Glu Phe Pro His Gly
305 310 315 320

Phe Thr Ala Gly Gly His Pro Val Gly Cys Ala Ile Ala Leu Lys Ala
325 330 335

Ile Asp Val Val Met Asn Glu Gly Leu Ala Glu Asn Val Arg Arg Leu
340 345 350

Ala Pro Arg Phe Glu Glu Arg Leu Lys His Ile Ala Glu Arg Pro Asn
355 360 365

Ile Gly Glu Tyr Arg Gly Ile Gly Phe Met Trp Ala Leu Glu Leu Val
370 375 380

Lys Asp Lys Ala Ser Lys Ala Pro Phe Asp Gly Asn Leu Ser Val Ser
385 390 395 400

Glu Arg Ile Ala Asn Thr Cys Thr Asp Leu Gly Leu Ile Cys Arg Pro
405 410 415

Thr Gly Gln Ser Val Val Leu Cys Pro Pro Phe Ile Leu Thr Glu Ala
420 425 430

Gln Met Asp Glu Met Phe Asp Lys Leu Glu Lys Ala Leu Asp Lys Val
435 440 445

Phe Ala Glu Val Ala
450

<210> 145
<211> 1359

CX2-126USP1_ST25

<212> DNA

<213> Artificial Sequence

<220>

<223> Engineered variant of V. fluvialis transaminase

<400> 145

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accggctttc cgtataacag cgtgtttggc ctgccgctgc cgggctttct gcatctgacc	540
tgcccgcatc attggcggtt tggcgaagaa ggcgaaaccg aagaacagtt tgcgcgcgt	600
ctggcccgtg aactggaaga aaccattcag aagggaaggc cgataccat tgcgggcttt	660
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ctggaaaaag cgctggataa agtgtttgcg gaagtggcg	1359

<210> 146

<211> 453

<212> PRT

<213> Artificial Sequence

<220>

<223> Engineered variant of V. fluvialis transaminase

<400> 146

Met	Asn	Lys	Pro	Gln	Ser	Trp	Glu	Thr	Arg	Ala	Glu	Thr	Tyr	Ser	Leu
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 20 30
 Val Ala His Gly Glu Gly Pro Tyr Ile Val Asp Val His Gly Arg Arg
 35 40 45
 Tyr Leu Asp Ala Asn Ser Gly Ala Phe Asn Met Val Ala Gly Phe Asp
 50 55 60
 His Lys Gly Leu Ile Asp Ala Ala Lys Ala Gln Tyr Glu Arg Phe Pro
 65 70 75 80
 Gly Tyr His Ala Phe Ser Gly His Met Ser Asp Gln Thr Val Met Leu
 85 90 95
 Ser Glu Lys Leu Val Glu Val Ser Pro Phe Asp Ser Gly Arg Val Phe
 100 105 110
 Tyr Thr Asn Ser Gly Ser Glu Ala Asn Asp Thr Met Val Lys Met Leu
 115 120 125
 Trp Phe Leu His Ala Ala Glu Gly Lys Pro Gln Lys Arg Lys Ile Leu
 130 135 140
 Thr Arg Trp Asn Ala Tyr His Gly Cys Thr Val Val Ser Ala Ser Met
 145 150 155 160
 Thr Gly Phe Pro Tyr Asn Ser Val Phe Gly Leu Pro Leu Pro Gly Phe
 165 170 175
 Leu His Leu Thr Cys Pro His Tyr Trp Arg Tyr Gly Glu Glu Gly Glu
 180 185 190
 Thr Glu Glu Gln Phe Val Ala Arg Leu Ala Arg Glu Leu Glu Glu Thr
 195 200 205
 Ile Gln Lys Glu Gly Ala Asp Thr Ile Ala Gly Phe Phe Ala Glu Pro
 210 215 220
 Val Met Gly Ala Gly Gly Val Ile Pro Pro Ala Lys Gly Tyr Phe Gln
 225 230 235 240
 Ala Ile Leu Pro Ile Leu Arg Lys Tyr Asp Ile Pro Val Ile Ser Asp
 245 250 255
 Glu Val Ile Cys Gly Phe Gly Arg Thr Gly Asn Thr Trp Gly Cys Val
 260 265 270
 Thr Tyr Asp Phe Thr Pro Asp Ala Ile Ile Ser Ser Lys Cys Leu Thr
 275 280 285

CX2-126USP1_ST25

Ala Gly Phe Phe Pro Val Gly Ala Val Ile Leu Gly Pro Glu Leu Ser
290 295 300

Lys Arg Leu Glu Thr Ala Ile Glu Ala Ile Gly Asn Phe Pro His Gly
305 310 315 320

Phe Thr Ala Gly Gly His Pro Val Gly Cys Ala Ile Ala Leu Lys Ala
325 330 335

Ile Asp Val Val Met Asn Glu Gly Leu Ala Glu Asn Val Arg Arg Leu
340 345 350

Ala Pro Arg Phe Glu Glu Arg Leu Lys His Ile Ala Glu Arg Pro Asn
355 360 365

Ile Gly Glu Tyr Arg Gly Ile Gly Phe Met Trp Ala Leu Glu Val Val
370 375 380

Lys Asp Lys Ala Ser Lys Ala Pro Phe Asp Gly Asn Leu Ser Val Ser
385 390 395 400

Glu Arg Ile Ala Asn Thr Cys Thr Asp Leu Gly Leu Ile Cys His Pro
405 410 415

Thr Gly Gln Ser Val Val Leu Cys Pro Pro Phe Ile Leu Thr Glu Ala
420 425 430

Gln Met Asp Glu Met Phe Asp Lys Leu Glu Lys Ala Leu Asp Lys Val
435 440 445

Phe Ala Glu Val Ala
450

<210> 147
<211> 1359
<212> DNA
<213> Artificial sequence

<220>
<223> Engineered variant of V. fluvialis transaminase

<400> 147
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atcgtggatg tgcattggccg tcgttatctg gatgcgaaca gcggcgcttt caacatgggtg 180
gcgggctttg atcataaagg cctgattgat gcggcgaaaag cgcagtatga acgttttccg 240
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gtggaagtga gcccgtttga tagcggccgt gtgttttata ccaacagcgg cagcgaagcg 360
aacgatacca tgggtgaaaat gctgtggttt ctgcatgcgg cggaaggcaa accgcaaaaa 420
cgtaaaattc tgaccggttg gaacgcgtat catggctgta ccgtagtgag cgcgagcatg 480

CX2-126USP1_ST25

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accggctttc cgtataacag cgtgtttggc ctgccgctgc cgggctttct gcatctgacc      540
tgcccgcatt attggcggtta tggcgaagaa ggcgaaaccg aagaacagtt tgtcgcgcgt      600
ctggcccgtg aactggaaga aaccattcag aaggaaggcg cggataccat tgcgggcttt      660
tttgcggaac cggatgatggg tgctggcggg gttattccgc cggcgaaagg ctattttcag      720
gcgattctgc cgatcctgcg caaatatgat attccgggtga tcagcgatga agtgatttgc      780
ggctttggcc gtaccggtaa cacctggggc tgcgtgacct atgattttac cccggatgcg      840
attattagca gtaaaaacct aaccgcgggt ttttttccgg taggcgcggg gattctgggt      900
ccggaactga gcaaactgtt ggaaaccgcg attgaagcga tcggcaattt tccgcatggt      960
tttaccacgg gcggccatcc ggtgggttgt gcgattgcgc tgaaagcgat tgatgtggtg     1020
atgaacgaag gcctggccga aaacgtgcgt cgtctggccc cgcgttttga agaactctg      1080
aaacatatgg cggaaactcc gaacattggc gaatatcgtg gcattggctt tatgtgggcg      1140
ctggaagtcg tgaaagataa agcgagcaaa gccccgtttg atggcaacct gagcgtgagc      1200
gaacgtattg cgaacacctg caccgatctg ggcctgattt gccgtccgac aggccagagc      1260
gtggttctgt gcccgcggtt tattctgacc gaagcgcaga tggatgaaat gttcgataaa      1320
ctggaaaaag cgctggataa agtgtttgcg gaagtggcg                                1359

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<210> 148
 <211> 453
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> Engineered variant of *V. fluvialis* transaminase
 <400> 148

Met Asn Lys Pro Gln Ser Trp Glu Thr Arg Ala Glu Thr Tyr Ser Leu
 1 5 10 15

Tyr Gly Phe Thr Asp Met Pro Ser Leu His Gln Arg Gly Thr Met Val
 20 25 30

Val Ala His Gly Glu Gly Pro Tyr Ile Val Asp Val His Gly Arg Arg
 35 40 45

Tyr Leu Asp Ala Asn Ser Gly Ala Phe Asn Met Val Ala Gly Phe Asp
 50 55 60

His Lys Gly Leu Ile Asp Ala Ala Lys Ala Gln Tyr Glu Arg Phe Pro
 65 70 75 80

Gly Tyr His Ala Phe Ser Gly His Met Ser Asp Gln Thr Val Met Leu
 85 90 95

Ser Glu Lys Leu Val Glu Val Ser Pro Phe Asp Ser Gly Arg Val Phe
 100 105 110

CX2-126USP1_ST25

Tyr Thr Asn Ser Gly Ser Glu Ala Asn Asp Thr Met Val Lys Met Leu
 115 120 125
 Trp Phe Leu His Ala Ala Glu Gly Lys Pro Gln Lys Arg Lys Ile Leu
 130 135 140
 Thr Arg Trp Asn Ala Tyr His Gly Cys Thr Val Val Ser Ala Ser Met
 145 150 155 160
 Thr Gly Phe Pro Tyr Asn Ser Val Phe Gly Leu Pro Leu Pro Gly Phe
 165 170 175
 Leu His Leu Thr Cys Pro His Tyr Trp Arg Tyr Gly Glu Glu Gly Glu
 180 185 190
 Thr Glu Glu Gln Phe Val Ala Arg Leu Ala Arg Glu Leu Glu Glu Thr
 195 200 205
 Ile Gln Lys Glu Gly Ala Asp Thr Ile Ala Gly Phe Phe Ala Glu Pro
 210 215 220
 Val Met Gly Ala Gly Gly Val Ile Pro Pro Ala Lys Gly Tyr Phe Gln
 225 230 235 240
 Ala Ile Leu Pro Ile Leu Arg Lys Tyr Asp Ile Pro Val Ile Ser Asp
 245 250 255
 Glu Val Ile Cys Gly Phe Gly Arg Thr Gly Asn Thr Trp Gly Cys Val
 260 265 270
 Thr Tyr Asp Phe Thr Pro Asp Ala Ile Ile Ser Ser Lys Asn Leu Thr
 275 280 285
 Ala Gly Phe Phe Pro Val Gly Ala Val Ile Leu Gly Pro Glu Leu Ser
 290 295 300
 Lys Arg Leu Glu Thr Ala Ile Glu Ala Ile Gly Asn Phe Pro His Gly
 305 310 315 320
 Phe Thr Thr Gly Gly His Pro Val Gly Cys Ala Ile Ala Leu Lys Ala
 325 330 335
 Ile Asp Val Val Met Asn Glu Gly Leu Ala Glu Asn Val Arg Arg Leu
 340 345 350
 Ala Pro Arg Phe Glu Glu Arg Leu Lys His Ile Ala Glu Arg Pro Asn
 355 360 365
 Ile Gly Glu Tyr Arg Gly Ile Gly Phe Met Trp Ala Leu Glu Val Val
 370 375 380

CX2-126USP1_ST25

Lys Asp Lys Ala Ser Lys Ala Pro Phe Asp Gly Asn Leu Ser Val Ser
385 390 395 400

Glu Arg Ile Ala Asn Thr Cys Thr Asp Leu Gly Leu Ile Cys Arg Pro
405 410 415

Thr Gly Gln Ser Val Val Leu Cys Pro Pro Phe Ile Leu Thr Glu Ala
420 425 430

Gln Met Asp Glu Met Phe Asp Lys Leu Glu Lys Ala Leu Asp Lys Val
435 440 445

Phe Ala Glu Val Ala
450

<210> 149
<211> 1359
<212> DNA
<213> Artificial Sequence

<220>
<223> Engineered variant of *V. fluvialis* transaminase

<400> 149
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gatatgccga gcctgcatca gcgtggcacc atggtggtgg cccatggcga agggccgtat 120
atcgtggatg tgcattggccg tcgttatctg gatgcgaaca gcggcgcttt caacatggtg 180
gcgggctttg atcataaagg cctgattgat gcggcgaaag cgcagtatga acgttttccg 240
ggctatcatg cgttttcagg ccatatgagc gatcagaccg tgatgctgtc tgaaaaactg 300
gtggaagtga gcccgtttga tagcggccgt gtgttttgta ccaacagcgg cagcgaagcg 360
aacgatacca tgggtgaaaat gctgtggttt ctgcatgcgg cggaaggcaa accgcagaaa 420
cgtaaaattc tgaccctgtg taacgcgtat catggctgta ccgtagtgag cgcgagcatg 480
accggctttc cgtataacag cgtgtttggc ctgccgctgc cgggctttct gcatctgacc 540
tgcccgcatt attggcggtt tggcgaagaa ggcgaaaccg aagaacagtt tgtcgcgcgt 600
ctggcccgtg aactggaaga aaccattcag aagggaaggc cgataccat tgcgggcttt 660
tttgcggaac cgggtgatggg tgctggcggg gttattccgc cggcgaaagg ctattttcag 720
gcgattctgc cgatcctgcg caaatatgat attccgggtg tcagcgatga agtgatttgc 780
ggctttggcc gtaccggtaa cacctggggc tgcgtgacct atgattttac cccggatgcg 840
attattagca gtaaattgcct aaccgcgggt ttttttccgg taggcgcggg gattctgggt 900
ccggaactga gcaaactgtt ggaaaccgcg attgaagcga tcggcagctt tccgcatggt 960
tttaccacgg gcggccatcc ggtgggttgt gcgattgcgc tgaaagcgat tgatgtggtg 1020
atgaacgaag gcctggccga aaacgtgcgt cgtctggccc cgcgttttga agaactctg 1080
aaacatatgt cggaacgtcc gaacattggc gaatatcgtg gcattggctt tatgtgggcg 1140

CX2-126USP1_ST25

ctggaaatgg tgaagataa agcgagcaaa gccccgtttg atggcaacct gagcgtgagc 1200
 gaacgtattg cgaacacctg caccgatctg ggcttgattt gccatccgac aggccagagc 1260
 gtggttctgt gcccgccgtt tattctgacc gaagcgcaga tggatgaaat gttcgataaa 1320
 ctggaaaaag cgctggataa agtgtttagc gaagtggcg 1359

<210> 150
 <211> 453
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> Engineered variant of V. fluvialis transaminase
 <400> 150

Met Asn Lys Pro Gln Ser Trp Glu Thr Arg Ala Glu Thr Tyr Ser Leu
 1 5 10 15

Tyr Gly Phe Thr Asp Met Pro Ser Leu His Gln Arg Gly Thr Met Val
 20 25 30

Val Ala His Gly Glu Gly Pro Tyr Ile Val Asp Val His Gly Arg Arg
 35 40 45

Tyr Leu Asp Ala Asn Ser Gly Ala Phe Asn Met Val Ala Gly Phe Asp
 50 55 60

His Lys Gly Leu Ile Asp Ala Ala Lys Ala Gln Tyr Glu Arg Phe Pro
 65 70 75 80

Gly Tyr His Ala Phe Ser Gly His Met Ser Asp Gln Thr Val Met Leu
 85 90 95

Ser Glu Lys Leu Val Glu Val Ser Pro Phe Asp Ser Gly Arg Val Phe
 100 105 110

Cys Thr Asn Ser Gly Ser Glu Ala Asn Asp Thr Met Val Lys Met Leu
 115 120 125

Trp Phe Leu His Ala Ala Glu Gly Lys Pro Gln Lys Arg Lys Ile Leu
 130 135 140

Thr Arg Val Asn Ala Tyr His Gly Cys Thr Val Val Ser Ala Ser Met
 145 150 155 160

Thr Gly Phe Pro Tyr Asn Ser Val Phe Gly Leu Pro Leu Pro Gly Phe
 165 170 175

Leu His Leu Thr Cys Pro His Tyr Trp Arg Tyr Gly Glu Glu Gly Glu
 180 185 190

CX2-126USP1_ST25

Thr Glu Glu Gln Phe Val Ala Arg Leu Ala Arg Glu Leu Glu Glu Thr
195 200 205

Ile Gln Lys Glu Gly Ala Asp Thr Ile Ala Gly Phe Phe Ala Glu Pro
210 215 220

Val Met Gly Ala Gly Gly Val Ile Pro Pro Ala Lys Gly Tyr Phe Gln
225 230 235 240

Ala Ile Leu Pro Ile Leu Arg Lys Tyr Asp Ile Pro Val Ile Ser Asp
245 250 255

Glu Val Ile Cys Gly Phe Gly Arg Thr Gly Asn Thr Trp Gly Cys Val
260 265 270

Thr Tyr Asp Phe Thr Pro Asp Ala Ile Ile Ser Ser Lys Cys Leu Thr
275 280 285

Ala Gly Phe Phe Pro Val Gly Ala Val Ile Leu Gly Pro Glu Leu Ser
290 295 300

Lys Arg Leu Glu Thr Ala Ile Glu Ala Ile Gly Ser Phe Pro His Gly
305 310 315 320

Phe Thr Thr Gly Gly His Pro Val Gly Cys Ala Ile Ala Leu Lys Ala
325 330 335

Ile Asp Val Val Met Asn Glu Gly Leu Ala Glu Asn Val Arg Arg Leu
340 345 350

Ala Pro Arg Phe Glu Glu Arg Leu Lys His Ile Ala Glu Arg Pro Asn
355 360 365

Ile Gly Glu Tyr Arg Gly Ile Gly Phe Met Trp Ala Leu Glu Met Val
370 375 380

Lys Asp Lys Ala Ser Lys Ala Pro Phe Asp Gly Asn Leu Ser Val Ser
385 390 395 400

Glu Arg Ile Ala Asn Thr Cys Thr Asp Leu Gly Leu Ile Cys His Pro
405 410 415

Thr Gly Gln Ser Val Val Leu Cys Pro Pro Phe Ile Leu Thr Glu Ala
420 425 430

Gln Met Asp Glu Met Phe Asp Lys Leu Glu Lys Ala Leu Asp Lys Val
435 440 445

Phe Ser Glu Val Ala
450

CX2-126USP1_ST25

<210> 151
 <211> 1359
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Engineered variant of *V. fluvialis* transaminase

<400> 151
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 gatatgccga gcctgcatca gcgtggcacc atggtggtgg cccatggcga agggccgtat 120
 atcgtggatg tgcattggcg tcgttatctg gatgcgaaca gcggcgcttt caacatggtg 180
 gcgggctttg atcataaagg cctgattgat gcggcgaaaag cgagtatga acgttttccg 240
 ggctatcatg cgtttttcagg ccatatgagc gatcagaccg tgatgctgtc tgaaaaactg 300
 gtggaagtga gcccgtttga tagcggccgt gtgtttctga ccaacagcgg cagcgaagcg 360
 aacgatacca tgggtgaaaat gctgtggttt ctgcatgcgg cggaaggcaa accgcagaaa 420
 cgtaaaattc tgaccctgtg gaacgcgtat catggctgta ccgtagtgag cgcgagcatg 480
 accggctttc cgtataacag cgtgtttggc ctgccgctgc cgggctttct gcatctgacc 540
 tgcccgcatc attggcggtt tggcgaaaaa ggcgaaaccg aagaacagtt tgcgcgcgt 600
 ctggcccgtg aactggaaga aaccattcag aagggaaggcg cggataccat tgcgggcttt 660
 tttgcggaac cgggtgatgg tgctggcggg gttattgtcc cggcgaaagg ctattttcag 720
 gcgattctgc cgatcctgcg caaatatgat attccggtga tcagcgatga agtgatttgc 780
 ggctttggcc gtaccggtaa cacctggggc tgcgtgacct atgattttac cccgatgacg 840
 attattagca gtaaaaacct aaccgcgggt ttttttccgg taggcgcggg gattctgggt 900
 ccggaactga gcaaactctt ggaaaccgcg attgaagcga tcggcaattt tccgcatggt 960
 tttaccgcgg gcggccatcc ggtgggttgt gcgattgcgc tgaaagcgat tgatgtggtg 1020
 atgaacgaag gcctggccga aaacgtgcgt cgtctggccc cgcgttttga agaactctg 1080
 aaacatattg cggaaactcc gaacattggc gaatatctg gcattggctt tatgtgggcg 1140
 ctggaaatgg tgaaagataa agcgagcaaa gccccgtttg atggcaacct gagcgtgagc 1200
 gaacgtattg cgaacacctg caccgatctg ggcctgattt gccatccgac aggccagagc 1260
 gtggttctgt gcccgcggtt tattctgacc gaagcgcaga tggatgaaat gttcgataaa 1320
 ctggaaaaag cgctggataa agtgtttagc gaagtggcg 1359

<210> 152
 <211> 453
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> Engineered variant of *V. fluvialis* transaminase

<400> 152

Met Asn Lys Pro Gln Ser Trp Glu Thr Arg Ala Glu Thr Tyr Ser Leu
 1 5 10 15

CX2-126USP1_ST25

Tyr Gly Phe Thr Asp Met Pro Ser Leu His Gln Arg Gly Thr Met Val
 20 25 30
 Val Ala His Gly Glu Gly Pro Tyr Ile Val Asp Val His Gly Arg Arg
 35 40 45
 Tyr Leu Asp Ala Asn Ser Gly Ala Phe Asn Met Val Ala Gly Phe Asp
 50 55 60
 His Lys Gly Leu Ile Asp Ala Ala Lys Ala Gln Tyr Glu Arg Phe Pro
 65 70 75 80
 Gly Tyr His Ala Phe Ser Gly His Met Ser Asp Gln Thr Val Met Leu
 85 90 95
 Ser Glu Lys Leu Val Glu Val Ser Pro Phe Asp Ser Gly Arg Val Phe
 100 105 110
 Leu Thr Asn Ser Gly Ser Glu Ala Asn Asp Thr Met Val Lys Met Leu
 115 120 125
 Trp Phe Leu His Ala Ala Glu Gly Lys Pro Gln Lys Arg Lys Ile Leu
 130 135 140
 Thr Arg Trp Asn Ala Tyr His Gly Cys Thr Val Val Ser Ala Ser Met
 145 150 155 160
 Thr Gly Phe Pro Tyr Asn Ser Val Phe Gly Leu Pro Leu Pro Gly Phe
 165 170 175
 Leu His Leu Thr Cys Pro His Tyr Trp Arg Tyr Gly Glu Lys Gly Glu
 180 185 190
 Thr Glu Glu Gln Phe Val Ala Arg Leu Ala Arg Glu Leu Glu Glu Thr
 195 200 205
 Ile Gln Lys Glu Gly Ala Asp Thr Ile Ala Gly Phe Phe Ala Glu Pro
 210 215 220
 Val Met Gly Ala Gly Gly Val Ile Val Pro Ala Lys Gly Tyr Phe Gln
 225 230 235 240
 Ala Ile Leu Pro Ile Leu Arg Lys Tyr Asp Ile Pro Val Ile Ser Asp
 245 250 255
 Glu Val Ile Cys Gly Phe Gly Arg Thr Gly Asn Thr Trp Gly Cys Val
 260 265 270
 Thr Tyr Asp Phe Thr Pro Asp Ala Ile Ile Ser Ser Lys Asn Leu Thr
 275 280 285

CX2-126USP1_ST25

Ala Gly Phe Phe Pro Val Gly Ala Val Ile Leu Gly Pro Glu Leu Ser
290 295 300

Lys Arg Leu Glu Thr Ala Ile Glu Ala Ile Gly Asn Phe Pro His Gly
305 310 315 320

Phe Thr Ala Gly Gly His Pro Val Gly Cys Ala Ile Ala Leu Lys Ala
325 330 335

Ile Asp Val Val Met Asn Glu Gly Leu Ala Glu Asn Val Arg Arg Leu
340 345 350

Ala Pro Arg Phe Glu Glu Arg Leu Lys His Ile Ala Glu Arg Pro Asn
355 360 365

Ile Gly Glu Tyr Arg Gly Ile Gly Phe Met Trp Ala Leu Glu Met Val
370 375 380

Lys Asp Lys Ala Ser Lys Ala Pro Phe Asp Gly Asn Leu Ser Val Ser
385 390 395 400

Glu Arg Ile Ala Asn Thr Cys Thr Asp Leu Gly Leu Ile Cys His Pro
405 410 415

Thr Gly Gln Ser Val Val Leu Cys Pro Pro Phe Ile Leu Thr Glu Ala
420 425 430

Gln Met Asp Glu Met Phe Asp Lys Leu Glu Lys Ala Leu Asp Lys Val
435 440 445

Phe Ser Glu Val Ala
450

<210> 153
<211> 1359
<212> DNA
<213> Artificial Sequence

<220>
<223> Engineered variant of v. fluvialis transaminase

<400> 153
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gatatgccga gcctgcatca gcgtggcacc atggtggtgg cccatggcga agggccgtat 120
atcgtggatg tgcattggcg tcgttatctg gatgcgaaca gcggcgcttt caacatggtg 180
gcgggctttg atcataaagg cctgattgat gcggcgaaaag cgcagtatga acgttttccg 240
ggctatcatg cgttttcagg ccatatgagc gatcagaccg tgatgctgtc tgaaaaactg 300
gtggaagtga gcccgttttg tagcggccgt gtgtttctga ccaacagcgg cagcgaagcg 360
aacgatacca tggtgaaaat gctgtggttt ctgcatgcgg cggaaggcaa accgcagaaa 420

CX2-126USP1_ST25

cgtaaaattc tgacccgtgt taacgcgtat catggctgta ccgtagtgag cgcgagcatg 480
accggctttc cgtataacag cgtgtttggc ctgccgctgc cgggctttct gcatctgacc 540
tgcccgcatt attggcgtaa tggcgaagaa ggcgaaaccg aagaacagtt tgtcgcgcgt 600
ctggcccgtg aactggaaga aaccattcag aaggaaggcg cggataccat tgcgggcttt 660
tttgcggaac cggatgatggg tgctggcggg gttattgtcc cggcgaaagg ctattttcag 720
gcgattctgc cgatcctgcg caaatatgat attccgggtga tcagcgatga agtgatttgc 780
ggctttggcc gtaccggtaa cacctggggc tgcgtgacct atgattttac cccggatgcg 840
attattagca gtaaaaacct aaccgcgggt ttttttccgg taggcgcggg gattctgggt 900
ccggaactga gcaaactgtt ggaaaccgcg attgaagcga tcggcaactt tccgcatggt 960
ttcaccgcgg gcggccatcc ggtgggttgt gcgattgcgc tgaaagcgat tgatgtggtg 1020
atgaacgaag gcctggccga aaacgtgcgt cgtctggccc cgcgttttga agaactctg 1080
aaacatattg cggaactgcc gaacattggc gaatatcgtg gcattggctt tatgtgggcg 1140
ctggaaacgg tgaaagataa agcgagcaaa gccccgtttg atggcaacct gagcgtgagc 1200
gaacgtattg cgaacacctg caccgatctg ggcttgattt gccatccgac aggccagagc 1260
gtggttctgt gcccgcggtt tattctgacc gaagcgcaga tggatgaaat gttcgataaa 1320
ctggaaaaag cgctggataa agtgtttagc gaagtggcg 1359

<210> 154
<211> 453
<212> PRT
<213> Artificial sequence

<220>
<223> Engineered variant of v. fluvialis transaminase

<400> 154

Met Asn Lys Pro Gln Ser Trp Glu Thr Arg Ala Glu Thr Tyr Ser Leu
1 5 10 15

Tyr Gly Phe Thr Asp Met Pro Ser Leu His Gln Arg Gly Thr Met Val
20 25 30

Val Ala His Gly Glu Gly Pro Tyr Ile Val Asp Val His Gly Arg Arg
35 40 45

Tyr Leu Asp Ala Asn Ser Gly Ala Phe Asn Met Val Ala Gly Phe Asp
50 55 60

His Lys Gly Leu Ile Asp Ala Ala Lys Ala Gln Tyr Glu Arg Phe Pro
65 70 75 80

Gly Tyr His Ala Phe Ser Gly His Met Ser Asp Gln Thr Val Met Leu
85 90 95

CX2-126USP1_ST25

Ser Glu Lys Leu Val Glu Val Ser Pro Phe Gly Ser Gly Arg Val Phe
100 105 110

Leu Thr Asn Ser Gly Ser Glu Ala Asn Asp Thr Met Val Lys Met Leu
115 120 125

Trp Phe Leu His Ala Ala Glu Gly Lys Pro Gln Lys Arg Lys Ile Leu
130 135 140

Thr Arg Val Asn Ala Tyr His Gly Cys Thr Val Val Ser Ala Ser Met
145 150 155 160

Thr Gly Phe Pro Tyr Asn Ser Val Phe Gly Leu Pro Leu Pro Gly Phe
165 170 175

Leu His Leu Thr Cys Pro His Tyr Trp Arg Tyr Gly Glu Glu Gly Glu
180 185 190

Thr Glu Glu Gln Phe Val Ala Arg Leu Ala Arg Glu Leu Glu Glu Thr
195 200 205

Ile Gln Lys Glu Gly Ala Asp Thr Ile Ala Gly Phe Phe Ala Glu Pro
210 215 220

Val Met Gly Ala Gly Gly Val Ile Val Pro Ala Lys Gly Tyr Phe Gln
225 230 235 240

Ala Ile Leu Pro Ile Leu Arg Lys Tyr Asp Ile Pro Val Ile Ser Asp
245 250 255

Glu Val Ile Cys Gly Phe Gly Arg Thr Gly Asn Thr Trp Gly Cys Val
260 265 270

Thr Tyr Asp Phe Thr Pro Asp Ala Ile Ile Ser Ser Lys Asn Leu Thr
275 280 285

Ala Gly Phe Phe Pro Val Gly Ala Val Ile Leu Gly Pro Glu Leu Ser
290 295 300

Lys Arg Leu Glu Thr Ala Ile Glu Ala Ile Gly Asn Phe Pro His Gly
305 310 315 320

Phe Thr Ala Gly Gly His Pro Val Gly Cys Ala Ile Ala Leu Lys Ala
325 330 335

Ile Asp Val Val Met Asn Glu Gly Leu Ala Glu Asn Val Arg Arg Leu
340 345 350

Ala Pro Arg Phe Glu Glu Arg Leu Lys His Ile Ala Glu Arg Pro Asn
355 360 365

CX2-126USP1_ST25

Ile Gly Glu Tyr Arg Gly Ile Gly Phe Met Trp Ala Leu Glu Thr Val
 370 375 380

Lys Asp Lys Ala Ser Lys Ala Pro Phe Asp Gly Asn Leu Ser Val Ser
 385 390 395 400

Glu Arg Ile Ala Asn Thr Cys Thr Asp Leu Gly Leu Ile Cys His Pro
 405 410 415

Thr Gly Gln Ser Val Val Leu Cys Pro Pro Phe Ile Leu Thr Glu Ala
 420 425 430

Gln Met Asp Glu Met Phe Asp Lys Leu Glu Lys Ala Leu Asp Lys Val
 435 440 445

Phe Ser Glu Val Ala
 450

<210> 155
 <211> 1359
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Engineered variant of V. fluvialis transaminase

<400> 155
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 gatatgccga gcctgcatca gcgtggcacc atggtggtgg cccatggcga aggcccgat 120
 atcgtggatg tgcattggcg tcgttatctg gatgcgaaca gcggcgcttt caacatggtg 180
 gcgggctttg atcataaagg cctgattgat gcggcgaaag cgcagtatga acgttttccg 240
 ggctatcatg cgttttcagg ccatatgagc gatcagaccg tgatgctgtc tgaaaaactg 300
 gtggaagtga gcccgttttg tagcggccgt gtgtttctga ccaacagcgg cagcgaagcg 360
 aacgatacca tgggtgaaaat gctgtggttt ctgcatgcgg cggaaggcaa accgcaaaaa 420
 cgtaaaattc tgaccggttg gaacgcgtat catggctgta ccgtagtgag cgcgagcatg 480
 accggctttc cgtataacag cgtgtttggc ctgccgctgc cgggctttct gcatctgacc 540
 tgcccgcat attggcggtta tggcgaagaa ggcgaaaccg aagaacagtt tgtcgcgcgt 600
 ctggcccgtg aactggaaga aaccattcag aagggaaggcg cggataccat tgcgggcttt 660
 tttgcggaac cgggtgatggg tgctggcggg gttattaccc cggcgaaagg ctattttcag 720
 gcgattctgc cgatcctgcg caaatatgat attccggtga tcagcgatga agtgatttgc 780
 ggctttggcc gtaccggtaa cacctggggc tgcgtgacct atgattttac cccggatgcg 840
 attattagca gtaaaaacct aaccgcgggt ttttttccgg taggcgcggg gattctgggt 900
 ccggaactga gcaaacgtct ggaaaccgcg attgaagcga tcggcaattt tccgcatggt 960
 tttaccacgg gcggccatcc ggtgggttgt gcgattgcgc tgaaagcgat tgatgtggtg 1020
 atgaacgaag gcctggccga aaacgtgcgt cgtctggccc cgcgttttga agaacgtctg 1080

CX2-126USP1_ST25

aaacatatg cggaacgtcc gaacattggc gaatatcgtg gcattggctt tatgtgggcg 1140
 ctggaagcgg tgaaagataa agcgagcaaa gccccgtttg atggcaacct gagcgtgagc 1200
 gaacgtattg cgaacacctg caccgatctg ggcctgattt gccgtccgac aggccagagc 1260
 gtggttctgt gcccgccgtt tattctgacc gaagcgcaga tggatgaaat gttcgataaa 1320
 ctggaaaaag cgctggataa agtgtttgcg gaagtggcg 1359

<210> 156
 <211> 453
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> Engineered variant of V. fluvialis transaminase
 <400> 156

Met Asn Lys Pro Gln Ser Trp Glu Thr Arg Ala Glu Thr Tyr Ser Leu
 1 5 10 15

Tyr Gly Phe Thr Asp Met Pro Ser Leu His Gln Arg Gly Thr Met Val
 20 25 30

Val Ala His Gly Glu Gly Pro Tyr Ile Val Asp Val His Gly Arg Arg
 35 40 45

Tyr Leu Asp Ala Asn Ser Gly Ala Phe Asn Met Val Ala Gly Phe Asp
 50 55 60

His Lys Gly Leu Ile Asp Ala Ala Lys Ala Gln Tyr Glu Arg Phe Pro
 65 70 75 80

Gly Tyr His Ala Phe Ser Gly His Met Ser Asp Gln Thr Val Met Leu
 85 90 95

Ser Glu Lys Leu Val Glu Val Ser Pro Phe Gly Ser Gly Arg Val Phe
 100 105 110

Leu Thr Asn Ser Gly Ser Glu Ala Asn Asp Thr Met Val Lys Met Leu
 115 120 125

Trp Phe Leu His Ala Ala Glu Gly Lys Pro Gln Lys Arg Lys Ile Leu
 130 135 140

Thr Arg Trp Asn Ala Tyr His Gly Cys Thr Val Val Ser Ala Ser Met
 145 150 155 160

Thr Gly Phe Pro Tyr Asn Ser Val Phe Gly Leu Pro Leu Pro Gly Phe
 165 170 175

Leu His Leu Thr Cys Pro His Tyr Trp Arg Tyr Gly Glu Glu Gly Glu
 180 185 190

CX2-126USP1_ST25

Thr Glu Glu Gln Phe Val Ala Arg Leu Ala Arg Glu Leu Glu Glu Thr
 195 200 205
 Ile Gln Lys Glu Gly Ala Asp Thr Ile Ala Gly Phe Phe Ala Glu Pro
 210 215 220
 Val Met Gly Ala Gly Gly Val Ile Thr Pro Ala Lys Gly Tyr Phe Gln
 225 230 235 240
 Ala Ile Leu Pro Ile Leu Arg Lys Tyr Asp Ile Pro Val Ile Ser Asp
 245 250 255
 Glu Val Ile Cys Gly Phe Gly Arg Thr Gly Asn Thr Trp Gly Cys Val
 260 265 270
 Thr Tyr Asp Phe Thr Pro Asp Ala Ile Ile Ser Ser Lys Asn Leu Thr
 275 280 285
 Ala Gly Phe Phe Pro Val Gly Ala Val Ile Leu Gly Pro Glu Leu Ser
 290 295 300
 Lys Arg Leu Glu Thr Ala Ile Glu Ala Ile Gly Asn Phe Pro His Gly
 305 310 315 320
 Phe Thr Thr Gly Gly His Pro Val Gly Cys Ala Ile Ala Leu Lys Ala
 325 330 335
 Ile Asp Val Val Met Asn Glu Gly Leu Ala Glu Asn Val Arg Arg Leu
 340 345 350
 Ala Pro Arg Phe Glu Glu Arg Leu Lys His Ile Ala Glu Arg Pro Asn
 355 360 365
 Ile Gly Glu Tyr Arg Gly Ile Gly Phe Met Trp Ala Leu Glu Ala Val
 370 375 380
 Lys Asp Lys Ala Ser Lys Ala Pro Phe Asp Gly Asn Leu Ser Val Ser
 385 390 395 400
 Glu Arg Ile Ala Asn Thr Cys Thr Asp Leu Gly Leu Ile Cys Arg Pro
 405 410 415
 Thr Gly Gln Ser Val Val Leu Cys Pro Pro Phe Ile Leu Thr Glu Ala
 420 425 430
 Gln Met Asp Glu Met Phe Asp Lys Leu Glu Lys Ala Leu Asp Lys Val
 435 440 445
 Phe Ala Glu Val Ala
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<210> 157
 <211> 1359
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Engineered variant of *V. fluvialis* transaminase

<400> 157
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 cgtaaaattc tgaccctgtg taacgcgtat catggctgta ccgtagtgag cgcgagcatg 480
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 ctggcccgtg aactggaaga aaccattcag aaggaaaggcg cggataccat tgcgggcttt 660
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<210> 158
 <211> 453
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> Engineered variant of *V. fluvialis* transaminase

<400> 158

CX2-126USP1_ST25

Met Asn Lys Pro Gln Ser Trp Glu Thr Arg Ala Glu Thr Tyr Ser Leu
1 5 10 15

Tyr Gly Phe Thr Asp Met Pro Ser Leu His Gln Arg Gly Thr Met Val
20 25 30

Val Ala His Gly Glu Gly Pro Tyr Ile Val Asp Val His Gly Arg Arg
35 40 45

Tyr Leu Asp Ala Asn Ser Gly Ala Phe Asn Met Val Ala Gly Phe Asp
50 55 60

His Lys Gly Leu Ile Asp Ala Ala Lys Ala Gln Tyr Glu Arg Phe Pro
65 70 75 80

Gly Tyr His Ala Phe Ser Gly His Met Ser Asp Gln Thr Val Met Leu
85 90 95

Ser Glu Lys Leu Val Glu Val Ser Pro Phe Gly Ser Gly Arg Val Phe
100 105 110

Tyr Thr Asn Ser Gly Ser Glu Ala Asn Asp Thr Met Val Lys Met Leu
115 120 125

Trp Phe Leu His Ala Ala Glu Gly Lys Pro Gln Lys Arg Lys Ile Leu
130 135 140

Thr Arg Val Asn Ala Tyr His Gly Cys Thr Val Val Ser Ala Ser Met
145 150 155 160

Thr Gly Phe Pro Tyr Asn Ser Val Phe Gly Leu Pro Leu Pro Gly Phe
165 170 175

Leu His Leu Thr Cys Pro His Tyr Trp Arg Tyr Gly Glu Glu Gly Glu
180 185 190

Thr Glu Glu Gln Phe Val Ala Arg Leu Ala Arg Glu Leu Glu Glu Thr
195 200 205

Ile Gln Lys Glu Gly Ala Asp Thr Ile Ala Gly Phe Phe Ala Glu Pro
210 215 220

Val Met Gly Ala Gly Gly Val Ile Pro Pro Ala Lys Gly Tyr Phe Gln
225 230 235 240

Ala Ile Leu Pro Ile Leu Arg Lys Tyr Asp Ile Pro Val Ile Ser Asp
245 250 255

Glu Val Ile Cys Gly Phe Gly Arg Thr Gly Asn Thr Trp Gly Cys Val
260 265 270

CX2-126USP1_ST25

Thr Tyr Asp Phe Thr Pro Asp Ala Ile Ile Ser Ser Lys Asn Leu Thr
275 280 285

Ala Gly Phe Phe Pro Val Gly Ala Val Ile Leu Gly Pro Glu Leu Ser
290 295 300

Lys Arg Leu Glu Thr Ala Ile Glu Ala Ile Gly Asn Phe Pro His Gly
305 310 315 320

Phe Thr Thr Gly Gly His Pro Val Gly Cys Ala Ile Ala Leu Lys Ala
325 330 335

Ile Asp Val Val Met Asn Glu Gly Leu Ala Glu Asn Val Arg Arg Leu
340 345 350

Ala Pro Arg Phe Glu Glu Arg Leu Lys His Ile Ala Glu Arg Pro Asn
355 360 365

Ile Gly Glu Tyr Arg Gly Ile Gly Phe Met Trp Ala Leu Glu Ala Val
370 375 380

Lys Asp Lys Ala Ser Lys Ala Pro Phe Asp Gly Asn Leu Ser Val Ser
385 390 395 400

Glu Arg Ile Ala Asn Thr Cys Thr Asp Leu Gly Leu Ile Cys His Pro
405 410 415

Thr Gly Gln Ser Val Val Leu Cys Pro Pro Phe Ile Leu Thr Glu Ala
420 425 430

Gln Met Asp Glu Met Phe Asp Lys Leu Glu Lys Ala Leu Asp Lys Val
435 440 445

Phe Ala Glu Val Ala
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<210> 159
<211> 1359
<212> DNA
<213> Artificial Sequence

<220>
<223> Engineered variant of V. fluvialis transaminase

<400> 159
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gcgggctttg atcataaagg cctgattgat gcggcgaaag cgagtatga acgttttccg 240
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gtggaagtga gcccgtttga tagcggccgt gtgttttata ccaacagcgg cagcgaagcg 360

CX2-126USP1_ST25

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 ctggcccgtg aactggaaga aaccattcag aaggaaggcg cggataccat tgcgggcttt 660
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 gcgattctgc cgatcctgcg caaatatgat attccggtga tcagcgatga agtgatttgc 780
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<210> 160

<211> 453

<212> PRT

<213> Artificial Sequence

<220>

<223> Engineered variant of V. fluvialis transaminase

<400> 160

Met Asn Lys Pro Gln Ser Trp Glu Thr Arg Ala Glu Thr Tyr Ser Leu
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Tyr Gly Phe Thr Asp Met Pro Ser Leu His Gln Arg Gly Thr Met Val
 20 25 30

Val Ala His Gly Glu Gly Pro Tyr Ile Val Asp Val His Gly Arg Arg
 35 40 45

Tyr Leu Asp Ala Asn Ser Gly Ala Phe Asn Met Val Ala Gly Phe Asp
 50 55 60

His Lys Gly Leu Ile Asp Ala Ala Lys Ala Gln Tyr Glu Arg Phe Pro
 65 70 75 80

Gly Tyr His Ala Phe Ser Gly His Met Ser Asp Gln Thr Val Met Leu
 85 90 95

CX2-126USP1_ST25

Ser Glu Lys Leu Val Glu Val Ser Pro Phe Asp Ser Gly Arg Val Phe
100 105 110

Tyr Thr Asn Ser Gly Ser Glu Ala Asn Asp Thr Met Val Lys Met Leu
115 120 125

Trp Phe Leu His Ala Ala Glu Gly Lys Pro Gln Lys Arg Lys Ile Leu
130 135 140

Thr Arg Trp Asn Ala Tyr His Gly Cys Thr Val Val Ser Ala Ser Met
145 150 155 160

Thr Gly Phe Pro Tyr Asn Ser Val Phe Gly Leu Pro Leu Pro Gly Phe
165 170 175

Leu His Leu Thr Cys Pro His Tyr Trp Arg Tyr Gly Glu Glu Gly Glu
180 185 190

Thr Glu Glu Gln Phe Val Ala Arg Leu Ala Arg Glu Leu Glu Glu Thr
195 200 205

Ile Gln Lys Glu Gly Ala Asp Thr Ile Ala Gly Phe Phe Ala Glu Pro
210 215 220

Val Met Gly Ala Gly Gly Val Ile Val Pro Ala Lys Gly Tyr Phe Gln
225 230 235 240

Ala Ile Leu Pro Ile Leu Arg Lys Tyr Asp Ile Pro Val Ile Ser Asp
245 250 255

Glu Val Ile Cys Gly Phe Gly Arg Thr Gly Asn Thr Trp Gly Cys Val
260 265 270

Thr Tyr Asp Phe Thr Pro Asp Ala Ile Ile Ser Ser Lys Asn Leu Thr
275 280 285

Ala Gly Phe Phe Pro Val Gly Ala Val Ile Leu Gly Pro Glu Leu Ser
290 295 300

Lys Arg Leu Glu Thr Ala Ile Glu Ala Ile Gly Asn Phe Pro His Gly
305 310 315 320

Phe Thr Thr Gly Gly His Pro Val Gly Cys Ala Ile Ala Leu Lys Ala
325 330 335

Ile Asp Val Val Met Asn Glu Gly Leu Ala Glu Asn Val Arg Arg Leu
340 345 350

Ala Pro Arg Phe Glu Glu Arg Leu Lys His Ile Ala Glu Arg Pro Asn
355 360 365

CX2-126USP1_ST25

Ile Gly Glu Tyr Arg Gly Ile Gly Phe Met Trp Ala Leu Glu Ile Val
370 375 380

Lys Asp Lys Ala Ser Lys Ala Pro Phe Asp Gly Asn Leu Ser Val Ser
385 390 395 400

Glu Arg Ile Ala Asn Thr Cys Thr Asp Leu Gly Leu Ile Cys His Pro
405 410 415

Thr Gly Gln Ser Val Val Leu Cys Pro Pro Phe Ile Leu Thr Glu Ala
420 425 430

Gln Met Asp Glu Met Phe Asp Lys Leu Glu Lys Ala Leu Asp Lys Val
435 440 445

Phe Ser Glu Val Ala
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<210> 161
<211> 1359
<212> DNA
<213> Artificial Sequence

<220>
<223> Engineered variant of V. fluvialis transaminase

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gcgggctttg atcataaagg cctgattgat gcggcgaaaag cgcagtatga acgttttccg 240
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cgtaaaattc tgaccctgtg taacgcgtat catggctgta ccgtagtgag cgcgagcatg 480
accggctttc cgtataacag cgtgtttggc ctgccgctgc cgggctttct gcatctgacc 540
tgcccgcatc attggcggtt tggcgaagaa ggcgaaaccg aagaacagtt tgtcgcgcgt 600
ctggcccgtg aactggaaga aaccattcag aaggaaaggc cgataccat tgcgggcttt 660
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gcgattctgc cgatcctgcg caaatatgat attccggtga tcagcgatga agtgatttgc 780
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CX2-126USP1_ST25

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<210> 162
<211> 453
<212> PRT
<213> Artificial sequence

<220>
<223> Engineered variant of v. fluvialis transaminase
<400> 162

Met Asn Lys Pro Gln Ser Trp Glu Thr Arg Ala Glu Thr Tyr Ser Leu
1 5 10 15

Tyr Gly Phe Thr Asp Met Pro Ser Leu His Gln Arg Gly Thr Met Val
20 25 30

Val Ala His Gly Glu Gly Pro Tyr Ile Val Asp Val His Gly Arg Arg
35 40 45

Tyr Leu Asp Ala Asn Ser Gly Ala Phe Asn Met Val Ala Gly Phe Asp
50 55 60

His Lys Gly Leu Ile Asp Ala Ala Lys Ala Gln Tyr Glu Arg Phe Pro
65 70 75 80

Gly Tyr His Ala Phe Ser Gly His Met Ser Asp Gln Thr Val Met Leu
85 90 95

Ser Glu Lys Leu Val Glu Val Ser Pro Phe Asp Ser Gly Arg Val Phe
100 105 110

Tyr Thr Asn Ser Gly Ser Glu Ala Asn Asp Thr Met Val Lys Met Leu
115 120 125

Trp Phe Leu His Ala Ala Glu Gly Lys Pro Gln Lys Arg Lys Ile Leu
130 135 140

Thr Arg Val Asn Ala Tyr His Gly Cys Thr Val Val Ser Ala Ser Met
145 150 155 160

Thr Gly Phe Pro Tyr Asn Ser Val Phe Gly Leu Pro Leu Pro Gly Phe
165 170 175

Leu His Leu Thr Cys Pro His Tyr Trp Arg Tyr Gly Glu Glu Gly Glu
 180 185 190
 Thr Glu Glu Gln Phe Val Ala Arg Leu Ala Arg Glu Leu Glu Glu Thr
 195 200 205
 Ile Gln Lys Glu Gly Ala Asp Thr Ile Ala Gly Phe Phe Ala Glu Pro
 210 215 220
 Val Met Gly Ala Gly Gly Val Ile Pro Pro Ala Lys Gly Tyr Phe Gln
 225 230 235 240
 Ala Ile Leu Pro Ile Leu Arg Lys Tyr Asp Ile Pro Val Ile Ser Asp
 245 250 255
 Glu Val Ile Cys Gly Phe Gly Arg Thr Gly Asn Thr Trp Gly Cys Val
 260 265 270
 Thr Tyr Asp Phe Thr Pro Asp Ala Ile Ile Ser Ser Lys Cys Leu Thr
 275 280 285
 Ala Gly Phe Phe Pro Val Gly Ala Val Ile Leu Gly Pro Glu Leu Ser
 290 295 300
 Lys Arg Leu Glu Thr Ala Ile Glu Ala Ile Gly Asn Phe Pro His Gly
 305 310 315 320
 Phe Thr Thr Gly Gly His Pro Val Gly Cys Ala Ile Ala Leu Lys Ala
 325 330 335
 Ile Asp Val Val Met Asn Glu Gly Leu Ala Glu Asn Val Arg Arg Leu
 340 345 350
 Ala Pro Arg Phe Glu Glu Arg Leu Lys His Ile Ala Glu Arg Pro Asn
 355 360 365
 Ile Gly Glu Tyr Arg Gly Ile Gly Phe Met Trp Ala Leu Glu Ile Val
 370 375 380
 Lys Asp Lys Ala Ser Lys Ala Pro Phe Asp Gly Asn Leu Ser Val Ser
 385 390 395 400
 Glu Arg Ile Ala Asn Thr Cys Thr Asp Leu Gly Leu Ile Ile Arg Pro
 405 410 415
 Thr Gly Gln Ser Val Val Leu Cys Pro Pro Phe Ile Leu Thr Glu Ala
 420 425 430
 Gln Met Asp Glu Met Phe Asp Lys Leu Glu Lys Ala Leu Asp Lys Val
 435 440 445

Phe Ser Glu Val Ala
450

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<211> 1359
<212> DNA
<213> Artificial Sequence

<220>
<223> Engineered variant of *V. fluvialis* transaminase

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<400> 164

Met Asn Lys Pro Gln Ser Trp Glu Thr Arg Ala Glu Thr Tyr Ser Leu
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Tyr Gly Phe Thr Asp Met Pro Ser Leu His Gln Arg Gly Thr Met Val
 20 25 30

Val Ala His Gly Glu Gly Pro Tyr Ile Val Asp Val His Gly Arg Arg
 35 40 45

Tyr Leu Asp Ala Asn Ser Gly Ala Phe Asn Met Val Ala Gly Phe Asp
 50 55 60

His Lys Gly Leu Ile Asp Ala Ala Lys Ala Gln Tyr Glu Arg Phe Pro
 65 70 75 80

Gly Tyr His Ala Phe Ser Gly His Met Ser Asp Gln Thr Val Met Leu
 85 90 95

Ser Glu Lys Leu Val Glu Val Ser Pro Phe Asp Ser Gly Arg Val Phe
 100 105 110

Tyr Thr Asn Ser Gly Ser Glu Ala Asn Asp Thr Met Val Lys Met Leu
 115 120 125

Trp Phe Leu His Ala Ala Glu Gly Lys Pro Gln Lys Arg Lys Ile Leu
 130 135 140

Thr Arg Trp Asn Ala Tyr His Gly Cys Thr Val Val Ser Ala Ser Met
 145 150 155 160

Thr Gly Phe Pro Tyr Asn Ser Val Phe Gly Leu Pro Leu Pro Gly Phe
 165 170 175

Leu His Leu Thr Cys Pro His Tyr Trp Arg Tyr Gly Glu Glu Gly Glu
 180 185 190

Thr Glu Glu Gln Phe Val Ala Arg Leu Ala Arg Glu Leu Glu Glu Thr
 195 200 205

Ile Gln Lys Glu Gly Ala Asp Thr Ile Ala Gly Phe Phe Ala Glu Pro
 210 215 220

Val Met Gly Ala Gly Gly Val Ile Thr Pro Ala Lys Gly Tyr Phe Gln
 225 230 235 240

Ala Ile Leu Pro Ile Leu Arg Lys Tyr Asp Ile Pro Val Ile Ser Asp
 245 250 255

Glu Val Ile Cys Gly Phe Gly Arg Thr Gly Asn Thr Trp Gly Cys Val
 260 265 270

CX2-126USP1_ST25

Thr Tyr Asp Phe Thr Pro Asp Ala Ile Ile Ser Ser Lys Cys Leu Thr
275 280 285

Ala Gly Phe Phe Pro Val Gly Ala Val Ile Leu Gly Pro Glu Leu Ser
290 295 300

Lys Arg Leu Glu Thr Ala Ile Glu Ala Ile Gly Asn Phe Pro His Gly
305 310 315 320

Phe Thr Thr Gly Gly His Pro Val Gly Cys Ala Ile Ala Leu Lys Ala
325 330 335

Ile Asp Val Val Met Asn Glu Gly Leu Ala Glu Asn Val Arg Arg Leu
340 345 350

Ala Pro Arg Phe Glu Glu Arg Leu Lys His Ile Ala Glu Arg Pro Asn
355 360 365

Ile Gly Glu Tyr Arg Gly Ile Gly Phe Met Trp Ala Leu Glu Ile Val
370 375 380

Lys Asp Lys Ala Ser Lys Ala Pro Phe Asp Gly Asn Leu Ser Val Ser
385 390 395 400

Glu Arg Ile Ala Asn Thr Cys Thr Asp Leu Gly Leu Ile Cys Arg Pro
405 410 415

Thr Gly Gln Ser Val Val Leu Cys Pro Pro Phe Ile Leu Thr Glu Ala
420 425 430

Gln Met Asp Glu Met Phe Asp Lys Leu Glu Lys Ala Leu Asp Lys Val
435 440 445

Phe Ser Glu Val Ala
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<210> 165
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<212> DNA
<213> Artificial Sequence

<220>
<223> Engineered variant of V. fluvialis transaminase

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gcgggctttg atcataaagg cctgattgat gcggcgaaag cgcagtatga acgttttccg	240
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cgtaaaattc tgacccgtgt taacgcgtat catggctgta ccgtagtgag cgcgagcatg      480
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tgcccgcatt attggcggtta tggcgaagaa ggcgaaaccg aagaacagtt tgtcgcgcgt      600
ctggcccgtg aactggaaga aaccattcag aaggaaggcg cgataacat tgcgggcttt      660
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<210> 166

<211> 453

<212> PRT

<213> Artificial Sequence

<220>

<223> Engineered variant of V. fluvialis transaminase

<400> 166

Met Asn Lys Pro Gln Ser Trp Glu Thr Arg Ala Glu Thr Tyr Ser Leu
1 5 10 15

Tyr Gly Phe Thr Asp Met Pro Ser Leu His Gln Arg Gly Thr Met Val
20 25 30

Val Ala His Gly Glu Gly Pro Tyr Ile Val Asp Val His Gly Arg Arg
35 40 45

Tyr Leu Asp Ala Asn Ser Gly Ala Phe Asn Met Val Ala Gly Phe Asp
50 55 60

His Lys Gly Leu Ile Asp Ala Ala Lys Ala Gln Tyr Glu Arg Phe Pro
65 70 75 80

CX2-126USP1_ST25

Gly Tyr His Ala Phe Ser Gly His Met Ser Asp Gln Thr Val Met Leu
85 90 95

Ser Glu Lys Leu Val Glu Val Ser Pro Phe Asp Ser Gly Arg Val Phe
100 105 110

Tyr Thr Asn Ser Gly Ser Glu Ala Asn Asp Thr Met Val Lys Met Leu
115 120 125

Trp Phe Leu His Ala Ala Glu Gly Lys Pro Gln Lys Arg Lys Ile Leu
130 135 140

Thr Arg Val Asn Ala Tyr His Gly Cys Thr Val Val Ser Ala Ser Met
145 150 155 160

Thr Gly Phe Pro Tyr Asn Ser Val Phe Gly Leu Pro Leu Pro Gly Phe
165 170 175

Leu His Leu Thr Cys Pro His Tyr Trp Arg Tyr Gly Glu Glu Gly Glu
180 185 190

Thr Glu Glu Gln Phe Val Ala Arg Leu Ala Arg Glu Leu Glu Glu Thr
195 200 205

Ile Gln Lys Glu Gly Ala Asp Thr Ile Ala Gly Phe Phe Ala Glu Pro
210 215 220

Val Met Gly Ala Gly Gly Val Ile Val Pro Ala Lys Gly Tyr Phe Gln
225 230 235 240

Ala Ile Leu Pro Ile Leu Arg Lys Tyr Asp Ile Pro Val Ile Ser Asp
245 250 255

Glu Val Ile Cys Gly Phe Gly Arg Thr Gly Asn Thr Trp Gly Cys Val
260 265 270

Thr Tyr Asp Phe Thr Pro Asp Ala Ile Ile Ser Ser Lys Asn Leu Thr
275 280 285

Ala Gly Phe Phe Pro Val Gly Ala Val Ile Leu Gly Pro Glu Leu Ser
290 295 300

Lys Arg Leu Glu Thr Ala Ile Glu Ala Ile Gly Asn Phe Pro His Gly
305 310 315 320

Phe Thr Thr Gly Gly His Pro Val Gly Cys Ala Ile Ala Leu Lys Ala
325 330 335

Ile Asp Val Val Met Asn Glu Gly Leu Ala Glu Asn Val Arg Arg Leu
340 345 350

CX2-126USP1_ST25

Ala Pro Arg Phe Glu Glu Arg Leu Lys His Ile Ala Glu Arg Pro Asn
355 360 365

Ile Gly Glu Tyr Arg Gly Ile Gly Phe Met Trp Ala Leu Glu Thr Val
370 375 380

Lys Asp Lys Ala Ser Lys Ala Pro Phe Asp Gly Asn Leu Ser Val Ser
385 390 395 400

Glu Arg Ile Ala Asn Thr Cys Thr Asp Leu Gly Leu Ile Cys His Pro
405 410 415

Thr Gly Gln Ser Val Val Leu Cys Pro Pro Phe Ile Leu Thr Glu Ala
420 425 430

Gln Met Asp Glu Met Phe Asp Lys Leu Glu Lys Ala Leu Asp Lys Val
435 440 445

Phe Ser Glu Val Ala
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<210> 167
<211> 1359
<212> DNA
<213> Artificial sequence

<220>
<223> Engineered variant of V. fluvialis transaminase

<400> 167
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gcgggctttg atcataaagg cctgattgat gcggcgaaag cgcagtatga acgttttccg 240
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aacgatacca tgggtgaaaat gctgtggttt ctgcatgcgg cggaaggcaa accgcagaaa 420
cgtaaaattc tgaccggtg gaacgcgtat catggctgta ccgtagtgag cgcgagcatg 480
accggctttc cgtataacag cgtgtttggc ctgccgctgc cgggctttct gcatctgacc 540
tgcccgcatc attggcggtt tggcgaagaa ggcgaaaccg aagaacagtt tgtcgcgcgt 600
ctggcccgtg aactggaaga aaccattcag aagggaaggcg cggataccat tgcgggcttt 660
tttgcggaac cggatgatgg tgctggcggg gttattccgc cggcgaaagg ctattttcag 720
gcgattctgc cgatcctgcg caaatatgat attccgggtga tcagcgatga agtgatttgc 780
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CX2-126USP1_ST25

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ctggaaaaag cgctggataa agtgtttgcg gaagtggcg 1359

<210> 168
<211> 453
<212> PRT
<213> Artificial Sequence

<220>
<223> Engineered variant of V. fluvialis transaminase
<400> 168

Met Asn Lys Pro Gln Ser Trp Glu Thr Arg Ala Glu Thr Tyr Ser Leu
1 5 10 15

Tyr Gly Phe Thr Asp Met Pro Ser Leu His Gln Arg Gly Thr Met Val
20 25 30

Val Ala His Gly Glu Gly Pro Tyr Ile Val Asp Val His Gly Arg Arg
35 40 45

Tyr Leu Asp Ala Asn Ser Gly Ala Phe Asn Met Val Ala Gly Phe Asp
50 55 60

His Lys Gly Leu Ile Asp Ala Ala Lys Ala Gln Tyr Glu Arg Phe Pro
65 70 75 80

Gly Tyr His Ala Phe Ser Gly His Met Ser Asp Gln Thr Val Met Leu
85 90 95

Ser Glu Lys Leu Val Glu Val Ser Pro Phe Asp Ser Gly Arg Val Phe
100 105 110

Tyr Thr Asn Ser Gly Ser Glu Ala Asn Asp Thr Met Val Lys Met Leu
115 120 125

Trp Phe Leu His Ala Ala Glu Gly Lys Pro Gln Lys Arg Lys Ile Leu
130 135 140

Thr Arg Trp Asn Ala Tyr His Gly Cys Thr Val Val Ser Ala Ser Met
145 150 155 160

Thr Gly Phe Pro Tyr Asn Ser Val Phe Gly Leu Pro Leu Pro Gly Phe
165 170 175

CX2-126USP1_ST25

Leu His Leu Thr Cys Pro His Tyr Trp Arg Tyr Gly Glu Glu Gly Glu
 180 185 190
 Thr Glu Glu Gln Phe Val Ala Arg Leu Ala Arg Glu Leu Glu Glu Thr
 195 200 205
 Ile Gln Lys Glu Gly Ala Asp Thr Ile Ala Gly Phe Phe Ala Glu Pro
 210 215 220
 Val Met Gly Ala Gly Gly Val Ile Pro Pro Ala Lys Gly Tyr Phe Gln
 225 230 235 240
 Ala Ile Leu Pro Ile Leu Arg Lys Tyr Asp Ile Pro Val Ile Ser Asp
 245 250 255
 Glu Val Ile Cys Gly Phe Gly Arg Thr Gly Asn Thr Trp Gly Cys Val
 260 265 270
 Thr Tyr Asp Phe Thr Pro Asp Ala Ile Ile Ser Ser Lys Asn Leu Thr
 275 280 285
 Ala Gly Phe Phe Pro Val Gly Ala Val Ile Leu Gly Pro Glu Leu Ser
 290 295 300
 Lys Arg Leu Glu Thr Ala Ile Glu Ala Ile Gly Asn Phe Pro His Gly
 305 310 315 320
 Phe Thr Ala Gly Gly His Pro Val Gly Cys Ala Ile Ala Leu Lys Ala
 325 330 335
 Ile Asp Val Val Met Asn Glu Gly Leu Ala Glu Asn Val Arg Arg Leu
 340 345 350
 Ala Pro Arg Phe Glu Glu Arg Leu Lys His Ile Ala Glu Arg Pro Asn
 355 360 365
 Ile Gly Glu Tyr Arg Gly Ile Gly Phe Met Trp Ala Leu Glu Ile Val
 370 375 380
 Lys Asp Lys Ala Ser Lys Ala Pro Phe Asp Gly Asn Leu Ser Val Ser
 385 390 395 400
 Glu Arg Ile Ala Asn Thr Cys Thr Asp Leu Gly Leu Ile Cys His Pro
 405 410 415
 Thr Gly Gln Ser Val Val Leu Cys Pro Pro Phe Ile Leu Thr Glu Ala
 420 425 430
 Gln Met Asp Glu Met Phe Asp Lys Leu Glu Lys Ala Leu Asp Lys Val
 435 440 445

Phe Ala Glu Val Ala
450

<210> 169
<211> 1359
<212> DNA
<213> Artificial Sequence

<220>
<223> Engineered variant of *V. fluvialis* transaminase

<400> 169
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atcgtggatg tgcattggcg tcgttatctg gatgcgaaca gcggcgcttt caacatggtg 180
gcgggctttg atcataaagg cctgattgat gcggcgaaaag cgagtatga acgttttccg 240
ggctatcatg cgttttcagg ccatatgagc gatcagaccg tgatgctgtc tgaaaaactg 300
gtggaagtga gcccgtttga tagcggccgt gtgttttata ccaacagcgg cagcgaagcg 360
aacgatacca tgggtgaaaat gctgtggttt ctgcatgcgg cggaaggcaa accgcagaaa 420
cgtaaaattc tgaccggttg gaacgcgtat catggctgta ccgtagtgag cgcgagcatg 480
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tgccgcgatt attggcggtt tggcgaagaa ggcgaaaccg aagaacagtt tgcgcgcgt 600
ctggcccgtg aactggaaga aaccattcag aagggaaggcg cggataccat tgcgggcttt 660
tttgcggaac cggatgatgg tgctggcggg gttattccgc cggcgaaagg ctattttcag 720
gcgattctgc cgatcctgcg caaatatgat attccggtga tcagcgatga agtgatttgc 780
ggctttggcc gtaccggtta cacctggggc tgcgtgacct atgattttac cccgatgacg 840
attattagca gtaaattgcct aaccgcgggt ttttttccgg taggcgcggg gattctgggt 900
ccggaactga gcaaactctt ggaaaccgcg attgaagcga tcggcagctt tccgatggt 960
tttaccacgg gcggccatcc ggtgggttgt gcgattgcgc tgaaagcgat tgatgtggtg 1020
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aaacatattg cggaaactcc gaacattggc gaatatctg gcattggctt tatgtgggcg 1140
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gaacgtattg cgaacacctg caccgatctg ggcctgattt gccgtccgac aggccagagc 1260
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ctggaaaaag cgctggataa agtgtttgcg gaagtggcg 1359

<210> 170
<211> 453
<212> PRT
<213> Artificial Sequence

<220>

<223> Engineered variant of *V. fluvialis* transaminase

<400> 170

Met Asn Lys Pro Gln Ser Trp Glu Thr Arg Ala Glu Thr Tyr Ser Leu
1 5 10 15

Tyr Gly Phe Thr Asp Met Pro Ser Leu His Gln Arg Gly Thr Met Val
20 25 30

Val Ala His Gly Glu Gly Pro Tyr Ile Val Asp Val His Gly Arg Arg
35 40 45

Tyr Leu Asp Ala Asn Ser Gly Ala Phe Asn Met Val Ala Gly Phe Asp
50 55 60

His Lys Gly Leu Ile Asp Ala Ala Lys Ala Gln Tyr Glu Arg Phe Pro
65 70 75 80

Gly Tyr His Ala Phe Ser Gly His Met Ser Asp Gln Thr Val Met Leu
85 90 95

Ser Glu Lys Leu Val Glu Val Ser Pro Phe Asp Ser Gly Arg Val Phe
100 105 110

Tyr Thr Asn Ser Gly Ser Glu Ala Asn Asp Thr Met Val Lys Met Leu
115 120 125

Trp Phe Leu His Ala Ala Glu Gly Lys Pro Gln Lys Arg Lys Ile Leu
130 135 140

Thr Arg Trp Asn Ala Tyr His Gly Cys Thr Val Val Ser Ala Ser Met
145 150 155 160

Thr Gly Phe Pro Tyr Asn Ser Val Phe Gly Leu Pro Leu Pro Gly Phe
165 170 175

Leu His Leu Thr Cys Pro His Tyr Trp Arg Tyr Gly Glu Glu Gly Glu
180 185 190

Thr Glu Glu Gln Phe Val Ala Arg Leu Ala Arg Glu Leu Glu Glu Thr
195 200 205

Ile Gln Lys Glu Gly Ala Asp Thr Ile Ala Gly Phe Phe Ala Glu Pro
210 215 220

Val Met Gly Ala Gly Gly Val Ile Pro Pro Ala Lys Gly Tyr Phe Gln
225 230 235 240

Ala Ile Leu Pro Ile Leu Arg Lys Tyr Asp Ile Pro Val Ile Ser Asp
245 250 255

CX2-126USP1_ST25

Glu Val Ile Cys Gly Phe Gly Arg Thr Gly Asn Thr Trp Gly Cys Val
260 265 270

Thr Tyr Asp Phe Thr Pro Asp Ala Ile Ile Ser Ser Lys Cys Leu Thr
275 280 285

Ala Gly Phe Phe Pro Val Gly Ala Val Ile Leu Gly Pro Glu Leu Ser
290 295 300

Lys Arg Leu Glu Thr Ala Ile Glu Ala Ile Gly Ser Phe Pro His Gly
305 310 315 320

Phe Thr Thr Gly Gly His Pro Val Gly Cys Ala Ile Ala Leu Lys Ala
325 330 335

Ile Asp Val Val Met Asn Glu Gly Leu Ala Glu Asn Val Arg Arg Leu
340 345 350

Ala Pro Arg Phe Glu Glu Arg Leu Lys His Ile Ala Glu Arg Pro Asn
355 360 365

Ile Gly Glu Tyr Arg Gly Ile Gly Phe Met Trp Ala Leu Glu Ile Val
370 375 380

Lys Asp Lys Ala Ser Lys Ala Pro Phe Asp Gly Asn Leu Ser Val Ser
385 390 395 400

Glu Arg Ile Ala Asn Thr Cys Thr Asp Leu Gly Leu Ile Cys Arg Pro
405 410 415

Thr Gly Gln Ser Val Val Leu Cys Pro Pro Phe Ile Leu Thr Glu Ala
420 425 430

Gln Met Asp Glu Met Phe Asp Lys Leu Glu Lys Ala Leu Asp Lys Val
435 440 445

Phe Ala Glu Val Ala
450

- <210> 171
- <211> 1359
- <212> DNA
- <213> Artificial Sequence

- <220>
- <223> Engineered variant of v. fluvialis transaminase

<400> 171
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atcgtggatg tgcattggccg tcgttatctg gatgcgaaca gcggcgcttt caacatggtg 180
gcgggctttg atcataaagg cctgattgat gcggcgaaag cgagtatga acgttttccg 240

CX2-126USP1_ST25

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aacgatacca tgggtgaaaat gctgtggttt ctgcatgcgg cggaaggcaa accgcaaaaa      420
cgtaaaattc tgacccgttg gaacgcgtat catggctgta ccgtagtgag cgcgagcatg      480
accggctttc cgtataacag cgtgtttggc ctgccgctgc cgggctttct gcatctgacc      540
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ctggcccgtg aactggaaga aaccattcag aaggaaggcg cggataccat tgcgggcttt      660
tttgcggaac cgggtgatggg tgctggcggg gttattgtcc cggcgaaagg ctattttcag      720
gcgattctgc cgatcctgcg caaatatgat attccgggtga tcagcgaatga agtgatttgc      780
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atgaacgaag gcctggccga aaacgtgcgt cgtctggccc cgcgttttga agaactctg      1080
aaacatattg cggaacgtcc gaacattggc gaatatcgtg gcattggctt tatgtgggcg      1140
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gaacgtattg cgaacacctg caccgatctg ggcttgattt gccgtccgac aggccagagc      1260
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<210> 172
 <211> 453
 <212> PRT
 <213> Artificial sequence

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 <223> Engineered variant of v. fluvialis transaminase
 <400> 172

Met Asn Lys Pro Gln Ser Trp Glu Thr Arg Ala Glu Thr Tyr Ser Leu
 1 5 10 15

Tyr Gly Phe Thr Asp Met Pro Ser Leu His Gln Arg Gly Thr Met Val
 20 25 30

Val Ala His Gly Glu Gly Pro Tyr Ile Val Asp Val His Gly Arg Arg
 35 40 45

Tyr Leu Asp Ala Asn Ser Gly Ala Phe Asn Met Val Ala Gly Phe Asp
 50 55 60

His Lys Gly Leu Ile Asp Ala Ala Lys Ala Gln Tyr Glu Arg Phe Pro
 65 70 75 80

CX2-126USP1_ST25

Gly Tyr His Ala Phe Ser Gly His Met Ser Asp Gln Thr Val Met Leu
 85 90 95
 Ser Glu Lys Leu Val Glu Val Ser Pro Phe Asp Ser Gly Arg Val Phe
 100 105 110
 Tyr Thr Asn Ser Gly Ser Glu Ala Asn Asp Thr Met Val Lys Met Leu
 115 120 125
 Trp Phe Leu His Ala Ala Glu Gly Lys Pro Gln Lys Arg Lys Ile Leu
 130 135 140
 Thr Arg Trp Asn Ala Tyr His Gly Cys Thr Val Val Ser Ala Ser Met
 145 150 155 160
 Thr Gly Phe Pro Tyr Asn Ser Val Phe Gly Leu Pro Leu Pro Gly Phe
 165 170 175
 Leu His Leu Thr Cys Pro His Tyr Trp Arg Tyr Gly Glu Glu Gly Glu
 180 185 190
 Thr Glu Glu Gln Phe Val Ala Arg Leu Ala Arg Glu Leu Glu Glu Thr
 195 200 205
 Ile Gln Lys Glu Gly Ala Asp Thr Ile Ala Gly Phe Phe Ala Glu Pro
 210 215 220
 Val Met Gly Ala Gly Gly Val Ile Val Pro Ala Lys Gly Tyr Phe Gln
 225 230 235 240
 Ala Ile Leu Pro Ile Leu Arg Lys Tyr Asp Ile Pro Val Ile Ser Asp
 245 250 255
 Glu Val Ile Cys Gly Phe Gly Arg Thr Gly Asn Thr Trp Gly Cys Val
 260 265 270
 Thr Tyr Asp Phe Thr Pro Asp Ala Ile Ile Ser Ser Lys Asn Leu Thr
 275 280 285
 Ala Gly Phe Phe Pro Val Gly Ala Val Ile Leu Gly Pro Glu Leu Ser
 290 295 300
 Lys Arg Leu Glu Thr Ala Ile Glu Ala Ile Gly Ser Phe Pro His Gly
 305 310 315 320
 Phe Thr Thr Gly Gly His Pro Val Gly Cys Ala Ile Ala Leu Lys Ala
 325 330 335
 Ile Asp Val Val Met Asn Glu Gly Leu Ala Glu Asn Val Arg Arg Leu
 340 345 350

CX2-126USP1_ST25

Ala Pro Arg Phe Glu Glu Arg Leu Lys His Ile Ala Glu Arg Pro Asn
355 360 365

Ile Gly Glu Tyr Arg Gly Ile Gly Phe Met Trp Ala Leu Glu Val Val
370 375 380

Lys Asp Lys Ala Ser Lys Ala Pro Phe Asp Gly Asn Leu Ser Val Ser
385 390 395 400

Glu Arg Ile Ala Asn Thr Cys Thr Asp Leu Gly Leu Ile Cys Arg Pro
405 410 415

Thr Gly Gln Ser Val Val Leu Cys Pro Pro Phe Ile Leu Thr Glu Ala
420 425 430

Gln Met Asp Glu Met Phe Asp Lys Leu Glu Lys Ala Leu Asp Lys Val
435 440 445

Phe Ala Glu Val Ala
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<210> 173
<211> 1359
<212> DNA
<213> Artificial Sequence

<220>
<223> Engineered variant of V. fluvialis transaminase

<400> 173
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tgcccgcat attggcggtta tggcgaagaa ggcgaaaccg aagaacagtt tgtcgcgcgt 600
ctggcccgtg aactggaaga aaccattcag aagggaaggcg cggataccat tgcgggcttt 660
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CX2-126USP1_ST25

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<210> 174

<211> 453

<212> PRT

<213> Artificial Sequence

<220>

<223> Engineered variant of V. fluvialis transaminase

<400> 174

Met Asn Lys Pro Gln Ser Trp Glu Thr Arg Ala Glu Thr Tyr Ser Leu
 1 5 10 15

Tyr Gly Phe Thr Asp Met Pro Ser Leu His Gln Arg Gly Thr Met Val
 20 25 30

Val Ala His Gly Glu Gly Pro Tyr Ile Val Asp Val His Gly Arg Arg
 35 40 45

Tyr Leu Asp Ala Asn Ser Gly Ala Phe Asn Met Val Ala Gly Phe Asp
 50 55 60

His Lys Gly Leu Ile Asp Ala Ala Lys Ala Gln Tyr Glu Arg Phe Pro
 65 70 75 80

Gly Tyr His Ala Phe Ser Gly His Met Ser Asp Gln Thr Val Met Leu
 85 90 95

Ser Glu Lys Leu Val Glu Val Ser Pro Phe Asp Ser Gly Arg Val Phe
 100 105 110

Cys Thr Asn Ser Gly Ser Glu Ala Asn Asp Thr Met Val Lys Met Leu
 115 120 125

Trp Phe Leu His Ala Ala Glu Gly Lys Pro Gln Lys Arg Lys Ile Leu
 130 135 140

Thr Arg Trp Asn Ala Tyr His Gly Cys Thr Val Val Ser Ala Ser Met
 145 150 155 160

Thr Gly Phe Pro Tyr Asn Ser Val Phe Gly Leu Pro Leu Pro Gly Phe
 165 170 175
 Leu His Leu Thr Cys Pro His Tyr Trp Arg Tyr Gly Glu Glu Gly Glu
 180 185 190
 Thr Glu Glu Gln Phe Val Ala Arg Leu Ala Arg Glu Leu Glu Glu Thr
 195 200 205
 Ile Gln Lys Glu Gly Ala Asp Thr Ile Ala Gly Phe Phe Ala Glu Pro
 210 215 220
 Val Met Gly Ala Gly Gly Val Ile Val Pro Ala Lys Gly Tyr Phe Gln
 225 230 235 240
 Ala Ile Leu Pro Ile Leu Arg Lys Tyr Asp Ile Pro Val Ile Ser Asp
 245 250 255
 Glu Val Ile Cys Gly Phe Gly Arg Thr Gly Asn Thr Trp Gly Cys Val
 260 265 270
 Thr Tyr Asp Phe Thr Pro Asp Ala Ile Ile Ser Ser Lys Asn Leu Thr
 275 280 285
 Ala Gly Phe Phe Pro Val Gly Ala Val Ile Leu Gly Pro Glu Leu Ser
 290 295 300
 Lys Arg Leu Glu Thr Ala Ile Glu Ala Ile Gly Asn Phe Pro His Gly
 305 310 315 320
 Phe Thr Ala Gly Gly His Pro Val Gly Cys Ala Ile Ala Leu Lys Ala
 325 330 335
 Ile Asp Val Val Met Asn Glu Gly Leu Ala Glu Asn Val Arg Arg Leu
 340 345 350
 Ala Pro Arg Phe Glu Glu Arg Leu Lys His Ile Ala Glu Arg Pro Asn
 355 360 365
 Ile Gly Glu Tyr Arg Gly Ile Gly Phe Met Trp Ala Leu Glu Ile Val
 370 375 380
 Lys Asp Lys Ala Ser Lys Ala Pro Phe Asp Gly Asn Leu Ser Val Ser
 385 390 395 400
 Glu Arg Ile Ala Asn Thr Cys Thr Asp Leu Gly Leu Ile Cys Arg Pro
 405 410 415
 Thr Gly Gln Ser Val Val Leu Cys Pro Pro Phe Ile Leu Thr Glu Ala
 420 425 430

CX2-126USP1_ST25

Gln Met Asp Glu Met Phe Asp Lys Leu Glu Lys Ala Leu Asp Lys Val
 435 440 445

Phe Ser Glu Val Ala
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<210> 175
 <211> 1359
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Engineered variant of *V. fluvialis* transaminase

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<400> 175
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gcgggctttg atcataaagg cctgattgat gcggcgaaaag cgcagtatga acgttttccg      240
ggctatcatg cgttttcagg ccatatgagc gatcagaccg tgatgctgtc tgaaaaactg      300
gtggaagtga gcccgtttga tagcggccgt gtgttttata ccaacagcgg cagcgaagcg      360
aacgatacca tgggtgaaaat gctgtggttt ctgcatgcgg cggaaggcaa accgcaaaaa      420
cgtaaaattc tgaccctgca caacgcgtat catggctgta ccgtagtgag cgcgagcatg      480
accggctttc cgtataacag cgtgtttggc ctgccgctgc cgggctttct gcattctgacc      540
tgcccgcatt attggcggtt tggcgaagaa ggcgaaaccg aagaacagtt tgtcgcgcgt      600
ctggcccgtg aactggaaga aaccattcag aaggaaaggcg cggataccat tgcgggcttt      660
tttgcggaac cgggtgatggg tgctggcggg gttattccgc cggcgaaagg ctattttcag      720
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ggctttggcc gtaccggtaa cacctggggc tgcgtgacct atgattttac cccggatgcg      840
attattagca gtaaattgcct aaccgcgggt ttttttccgg taggcgcggt gattctgggt      900
ccggaactga gcaaactgtt ggaaaccgcg attgaagcga tcggcagctt tccgcatggt      960
tttaccacgg gcggccatcc ggtgggttgt gcgattgcgc tgaaagcgat tgatgtggtg     1020
atgaacgaag gcctggccga aaacgtgcgt cgtctggccc cgcgttttga agaactctg     1080
aaacatattg cggaacgtcc gaacattggc gaatatcgtg gcattggctt tatgtgggcg     1140
ctggaagcgg tgaaagataa agcgagcaaa gccccgtttg atggcaacct gagcgtgagc     1200
gaacgtattg cgaacacctg caccgatctg ggcctgattt gccatccgac aggccagagc     1260
gtggttctgt gcccgcggtt tattctgacc gaagcgcaga tggatgaaat gttcgataaa     1320
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<210> 176
 <211> 453
 <212> PRT
 <213> Artificial Sequence

CX2-126USP1_ST25

<220>

<223> Engineered variant of V. fluvialis transaminase

<400> 176

Met Asn Lys Pro Gln Ser Trp Glu Thr Arg Ala Glu Thr Tyr Ser Leu
1 5 10 15

Tyr Gly Phe Thr Asp Met Pro Ser Leu His Gln Arg Gly Thr Val Val
20 25 30

Val Ala His Gly Glu Gly Pro Tyr Ile Val Asp Val His Gly Arg Arg
35 40 45

Tyr Leu Asp Ala Asn Ser Gly Ala Phe Asn Met Val Ala Gly Phe Asp
50 55 60

His Lys Gly Leu Ile Asp Ala Ala Lys Ala Gln Tyr Glu Arg Phe Pro
65 70 75 80

Gly Tyr His Ala Phe Ser Gly His Met Ser Asp Gln Thr Val Met Leu
85 90 95

Ser Glu Lys Leu Val Glu Val Ser Pro Phe Asp Ser Gly Arg Val Phe
100 105 110

Tyr Thr Asn Ser Gly Ser Glu Ala Asn Asp Thr Met Val Lys Met Leu
115 120 125

Trp Phe Leu His Ala Ala Glu Gly Lys Pro Gln Lys Arg Lys Ile Leu
130 135 140

Thr Arg His Asn Ala Tyr His Gly Cys Thr Val Val Ser Ala Ser Met
145 150 155 160

Thr Gly Phe Pro Tyr Asn Ser Val Phe Gly Leu Pro Leu Pro Gly Phe
165 170 175

Leu His Leu Thr Cys Pro His Tyr Trp Arg Tyr Gly Glu Glu Gly Glu
180 185 190

Thr Glu Glu Gln Phe Val Ala Arg Leu Ala Arg Glu Leu Glu Glu Thr
195 200 205

Ile Gln Lys Glu Gly Ala Asp Thr Ile Ala Gly Phe Phe Ala Glu Pro
210 215 220

Val Met Gly Ala Gly Gly Val Ile Pro Pro Ala Lys Gly Tyr Phe Gln
225 230 235 240

Ala Ile Leu Pro Ile Leu Arg Lys Tyr Asp Ile Pro Val Ile Ser Asp
245 250 255

CX2-126USP1_ST25

Glu Val Ile Cys Gly Phe Gly Arg Thr Gly Asn Thr Trp Gly Cys Val
 260 265 270
 Thr Tyr Asp Phe Thr Pro Asp Ala Ile Ile Ser Ser Lys Cys Leu Thr
 275 280 285
 Ala Gly Phe Phe Pro Val Gly Ala Val Ile Leu Gly Pro Glu Leu Ser
 290 295 300
 Lys Arg Leu Glu Thr Ala Ile Glu Ala Ile Gly Ser Phe Pro His Gly
 305 310 315 320
 Phe Thr Thr Gly Gly His Pro Val Gly Cys Ala Ile Ala Leu Lys Ala
 325 330 335
 Ile Asp Val Val Met Asn Glu Gly Leu Ala Glu Asn Val Arg Arg Leu
 340 345 350
 Ala Pro Arg Phe Glu Glu Arg Leu Lys His Ile Ala Glu Arg Pro Asn
 355 360 365
 Ile Gly Glu Tyr Arg Gly Ile Gly Phe Met Trp Ala Leu Glu Ala Val
 370 375 380
 Lys Asp Lys Ala Ser Lys Ala Pro Phe Asp Gly Asn Leu Ser Val Ser
 385 390 395 400
 Glu Arg Ile Ala Asn Thr Cys Thr Asp Leu Gly Leu Ile Cys His Pro
 405 410 415
 Thr Gly Gln Ser Val Val Leu Cys Pro Pro Phe Ile Leu Thr Glu Ala
 420 425 430
 Gln Met Asp Glu Met Phe Asp Lys Leu Glu Lys Ala Leu Asp Lys Val
 435 440 445
 Phe Ala Glu Val Ala
 450

<210> 177
 <211> 1359
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Engineered variant of V. fluvialis transaminase

<400> 177	
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gatatgccga gcctgcatca gcgtggcacc atggtggtgg cccatggcga aggcccgat	120
atcgtggatg tgcattggccg tcgttatctg gatgcgaaca gcggcgcttt caacatggtg	180

CX2-126USP1_ST25

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 ggctatcatg cgttttcagg ccatatgagc gatcagaccg tgatgctgtc tgaaaaactg 300
 gtggaagtga gcccgtttga tagcggccgt gtgttttata ccaacagcgg cagcgaagcg 360
 aacgatacca tgggtgaaaat gctgtggttt ctgcatgcgg cggaaggcaa accgcagaaa 420
 cgtaaaattc tgaccctgtg gaacgcgtat catggctgta ccgtagtgag cgcgagcatg 480
 accggctttc cgtataacag cgtgtttggc ctgccgctgc cgggctttct gcatctgacc 540
 tgcccgcatt attggcggtt tggcgaagaa ggcgaaaccg aagaacagtt tgtcgcgcgt 600
 ctggcccgtg aactggaaga aaccattcag aaggaaaggcg cggataccat tgcgggcttt 660
 tttgcggaac cgggtgatggg tgctggcggg gttattccgc cggcgaaagg ctattttcag 720
 gcgattctgc cgatcctgcg caaatatgat attccggtga tcagcgatga agtgatttgc 780
 ggctttggcc gtaccggtta cacctggggc tgcgtgacct atgattttac cccggatgcg 840
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 ccggaactga gcaaactgtt ggaaaccgcg attgaagcga tcggcaactt tccgcatggt 960
 tttaccacgg gcggccatcc ggtgggttgt gcgattgcgc tgaaagcgat tgatgtggtg 1020
 atgaacgaag gcctggccga aaacgtgcgt cgtctggccc cgcgttttga agaactgtctg 1080
 aaacatattg cggaactgcc gaacattggc gaatatcgtg gcattggctt tatgtgggcg 1140
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 gaacgtattg cgaacacctg caccgatctg ggcctgattt gccgtccgac aggccagagc 1260
 gtggttctgt gcccgcggtt tattctgacc gaagcgcaga tggatgaaat gttcgataaa 1320
 ctggaaaaag cgctggataa agtgtttagc gaagtggcg 1359

<210> 178
 <211> 453
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> Engineered variant of V. fluvialis transaminase

<400> 178

Met Asn Lys Pro Gln Ser Trp Glu Thr Arg Ala Glu Thr Tyr Ser Leu
 1 5 10 15

Tyr Gly Phe Thr Asp Met Pro Ser Leu His Gln Arg Gly Thr Met Val
 20 25 30

Val Ala His Gly Glu Gly Pro Tyr Ile Val Asp Val His Gly Arg Arg
 35 40 45

Tyr Leu Asp Ala Asn Ser Gly Ala Phe Asn Met Val Ala Gly Phe Asp
 50 55 60

CX2-126USP1_ST25

His Lys Gly Leu Ile Asp Ala Ala Lys Ala Gln Tyr Glu Arg Phe Pro
 65 70 75 80
 Gly Tyr His Ala Phe Ser Gly His Met Ser Asp Gln Thr Val Met Leu
 85 90 95
 Ser Glu Lys Leu Val Glu Val Ser Pro Phe Asp Ser Gly Arg Val Phe
 100 105 110
 Tyr Thr Asn Ser Gly Ser Glu Ala Asn Asp Thr Met Val Lys Met Leu
 115 120 125
 Trp Phe Leu His Ala Ala Glu Gly Lys Pro Gln Lys Arg Lys Ile Leu
 130 135 140
 Thr Arg Trp Asn Ala Tyr His Gly Cys Thr Val Val Ser Ala Ser Met
 145 150 155 160
 Thr Gly Phe Pro Tyr Asn Ser Val Phe Gly Leu Pro Leu Pro Gly Phe
 165 170 175
 Leu His Leu Thr Cys Pro His Tyr Trp Arg Tyr Gly Glu Glu Gly Glu
 180 185 190
 Thr Glu Glu Gln Phe Val Ala Arg Leu Ala Arg Glu Leu Glu Glu Thr
 195 200 205
 Ile Gln Lys Glu Gly Ala Asp Thr Ile Ala Gly Phe Phe Ala Glu Pro
 210 215 220
 Val Met Gly Ala Gly Gly Val Ile Pro Pro Ala Lys Gly Tyr Phe Gln
 225 230 235 240
 Ala Ile Leu Pro Ile Leu Arg Lys Tyr Asp Ile Pro Val Ile Ser Asp
 245 250 255
 Glu Val Ile Cys Gly Phe Gly Arg Thr Gly Asn Thr Trp Gly Cys Val
 260 265 270
 Thr Tyr Asp Phe Thr Pro Asp Ala Ile Ile Ser Ser Lys Cys Leu Thr
 275 280 285
 Ala Gly Phe Phe Pro Val Gly Ala Val Ile Leu Gly Pro Glu Leu Ser
 290 295 300
 Lys Arg Leu Glu Thr Ala Ile Glu Ala Ile Gly Asn Phe Pro His Gly
 305 310 315 320
 Phe Thr Thr Gly Gly His Pro Val Gly Cys Ala Ile Ala Leu Lys Ala
 325 330 335

CX2-126USP1_ST25

Ile Asp Val Val Met Asn Glu Gly Leu Ala Glu Asn Val Arg Arg Leu
340 345 350

Ala Pro Arg Phe Glu Glu Arg Leu Lys His Ile Ala Glu Arg Pro Asn
355 360 365

Ile Gly Glu Tyr Arg Gly Ile Gly Phe Met Trp Ala Leu Glu Ala Val
370 375 380

Lys Asp Lys Ala Ser Lys Ala Pro Phe Asp Gly Asn Leu Ser Val Ser
385 390 395 400

Glu Arg Ile Ala Asn Thr Cys Thr Asp Leu Gly Leu Ile Cys Arg Pro
405 410 415

Thr Gly Gln Ser Val Val Leu Cys Pro Pro Phe Ile Leu Thr Glu Ala
420 425 430

Gln Met Asp Glu Met Phe Asp Lys Leu Glu Lys Ala Leu Asp Lys Val
435 440 445

Phe Ser Glu Val Ala
450

<210> 179
<211> 1359
<212> DNA
<213> Artificial Sequence

<220>
<223> Engineered variant of v. fluvialis transaminase

<400> 179
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atcgtggatg tgcattgccc tcgttatctg gatgcgaaca gcggcgcttt caacatgggtg 180
gcgggctttg atcataaagg cctgattgat gcggcgaaaag cgcagtatga acgttttccg 240
ggctatcatg cgttttcagg ccatatgagc gatcagaccg tgatgctgtc tgaaaaactg 300
gtggaagtga gcccgtttga tagcggccgt gtgttttata ccaacagcgg cagcgaagcg 360
aacgatacca tgggtgaaaat gctgtggttt ctgcatgcgg cggaaggcaa accgcagaaa 420
cgtaaaattc tgaccctgca caacgcgtat catggctgta ccgtagtgag cgcgagcatg 480
accggctttc cgtataacag cgtgtttggc ctgccgctgc cgggctttct gcatctgacc 540
tgcccgcatc attggcggtt tggcgaagaa ggcgaaaccg aagaacagtt tgtcgcgcgt 600
ctggcccgtg aactggaaga aaccattcag aaggaaaggcg cggataccat tgcgggcttt 660
tttgcggaac cggatgatggg tgctggcggg gttattccgc cggcgaaagg ctattttcag 720
gcgattctgc cgatcctgcg caaatatgat attccggtga tcagcgatga agtgatttgc 780
ggcttttgcc gtaccggtaa cacctggggc tgcgtgacct atgattttac cccggatgcg 840

CX2-126USP1_ST25

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attattagca gtaaaaacct aaccgcgggt ttttttccgg taggcgcggt gattctgggt      900
ccggaactga gcaaacgtct ggaaaccgcg attgaagcga tcggcaattt tccgcatggt      960
tttaccacgg gcggccatcc ggtgggttgt gcgattgcgc tgaaagcgat tgatgtgggt    1020
atgaacgaag gcctggccga aaacgtgcgt cgtctggccc cgcgttttga agaacgtctg    1080
aaacatatatg cggaacgtcc gaacattggc gaatatcgtg gcattggcctt tatgtgggcg    1140
ctggaaatcg tgaaagataa agcgagcaaa gccccgtttg atggcaacct gagcgtgagc    1200
gaacgtattg cgaacacctg caccgatctg ggcctgattt gccgtccgac aggccagagc    1260
gtggttctgt gcccgcggtt tattctgacc gaagcgcaga tggatgaaat gttcgataaa    1320
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<210> 180
 <211> 453
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> Engineered variant of V. fluvialis transaminase
 <400> 180

Met Asn Lys Pro Gln Ser Trp Glu Thr Arg Ala Glu Thr Tyr Ser Leu
 1 5 10 15

Tyr Gly Phe Thr Asp Met Pro Ser Leu His Gln Arg Gly Thr Met Val
 20 25 30

Val Ala His Gly Glu Gly Pro Tyr Ile Val Asp Val His Gly Arg Arg
 35 40 45

Tyr Leu Asp Ala Asn Ser Gly Ala Phe Asn Met Val Ala Gly Phe Asp
 50 55 60

His Lys Gly Leu Ile Asp Ala Ala Lys Ala Gln Tyr Glu Arg Phe Pro
 65 70 75 80

Gly Tyr His Ala Phe Ser Gly His Met Ser Asp Gln Thr Val Met Leu
 85 90 95

Ser Glu Lys Leu Val Glu Val Ser Pro Phe Asp Ser Gly Arg Val Phe
 100 105 110

Tyr Thr Asn Ser Gly Ser Glu Ala Asn Asp Thr Met Val Lys Met Leu
 115 120 125

Trp Phe Leu His Ala Ala Glu Gly Lys Pro Gln Lys Arg Lys Ile Leu
 130 135 140

Thr Arg His Asn Ala Tyr His Gly Cys Thr Val Val Ser Ala Ser Met
 145 150 155 160

CX2-126USP1_ST25

Thr Gly Phe Pro Tyr 165 Asn Ser Val Phe Gly 170 Leu Pro Leu Pro Gly 175 Phe
 Leu His Leu Thr 180 Cys Pro His Tyr Trp 185 Arg Tyr Gly Glu Glu 190 Gly Glu
 Thr Glu Glu 195 Gln Phe Val Ala Arg 200 Leu Ala Arg Glu Leu 205 Glu Glu Thr
 Ile Gln 210 Lys Glu Gly Ala Asp 215 Thr Ile Ala Gly Phe 220 Phe Ala Glu Pro
 Val 225 Met Gly Ala Gly Gly 230 Val Ile Pro Pro Ala 235 Lys Gly Tyr Phe Gln 240
 Ala Ile Leu Pro Ile 245 Leu Arg Lys Tyr Asp 250 Ile Pro Val Ile Ser 255 Asp
 Glu Val Ile Cys 260 Gly Phe Gly Arg Thr 265 Gly Asn Thr Trp Gly 270 Cys Val
 Thr Tyr Asp 275 Phe Thr Pro Asp Ala 280 Ile Ile Ser Ser Lys 285 Asn Leu Thr
 Ala Gly 290 Phe Phe Pro Val Gly 295 Ala Val Ile Leu Gly 300 Pro Glu Leu Ser
 Lys 305 Arg Leu Glu Thr Ala 310 Ile Glu Ala Ile Gly 315 Asn Phe Pro His Gly 320
 Phe Thr Thr Gly Gly 325 His Pro Val Gly Cys 330 Ala Ile Ala Leu Lys 335 Ala
 Ile Asp Val Val 340 Met Asn Glu Gly Leu 345 Ala Glu Asn Val Arg 350 Arg Leu
 Ala Pro Arg 355 Phe Glu Glu Arg Leu 360 Lys His Ile Ala Glu 365 Arg Pro Asn
 Ile Gly 370 Glu Tyr Arg Gly Ile 375 Gly Phe Met Trp Ala 380 Leu Glu Ile Val
 Lys 385 Asp Lys Ala Ser Lys 390 Ala Pro Phe Asp Gly 395 Asn Leu Ser Val Ser 400
 Glu Arg Ile Ala Asn 405 Thr Cys Thr Asp Leu 410 Gly Leu Ile Cys Arg 415 Pro
 Thr Gly Gln Ser 420 Val Val Leu Cys Pro 425 Pro Phe Ile Leu Thr 430 Glu Ala

Gln Met Asp Glu Met Phe Asp Lys Leu Glu Lys Ala Leu Asp Lys Val
 435 440 445

Phe Ser Glu Val Ala
 450

<210> 181
 <211> 1359
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> Engineered variant of V. fluvialis transaminase

<400> 181
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 atcgtggatg tgcattggccg tcgttatctg gatgcgaaca gcggcgcttt caacatggtg 180
 gcgggctttg atcataaagg cctgattgat gcggcgaaag cgcagtatga acgttttccg 240
 ggctatcatg cgttttcagg ccataatgagc gatcagaccg tgatgctgtc tgaaaaactg 300
 gtggaagtga gcccgtttga tagcggccgt gtgttttata ccaacagcgg cagcgaagcg 360
 aacgatacca tgggtgaaaat gctgtggttt ctgcatgcgg cggaaggcaa accgcagaaa 420
 cgtaaaattc tgaccctgca caacgcgtat catggctgta ccgtagtgag cgcgagcatg 480
 accggctttc cgtataacag cgtgtttggc ctgccgctgc cgggctttct gcattctgacc 540
 tgcccgcatt attggcggtt tggcgaagaa ggcgaaaccg aagaacagtt tgcgcgcgt 600
 ctggcccgtg aactggaaga aaccattcag aagggaaggc cgataccat tgcgggcttt 660
 tttgcggaac cgggtgatggg tgctggcggg gttattgtcc cggcgaaaagg ctattttcag 720
 gcgattctgc cgatcctgcg caaatatgat attccgggtg tcagcgatga agtgatttgc 780
 ggctttggcc gtaccggtaa cacctggggc tgcgtgacct atgattttac cccggatgcg 840
 attattagca gtaaaaacct aaccgcgggt ttttttccgg taggcgcggg gattctgggt 900
 ccggaactga gcaaacgtct ggaaaccgcg attgaagcga tcggcagctt tccgcatggt 960
 tttaccacgg gcggccatcc ggtgggttgt gcgattgcgc tgaaagcgat tgatgtggtg 1020
 atgaacgaag gcctggccga aaacgtgcgt cgtctggccc cgcgttttga agaacgtctg 1080
 aaacatattg cggaacgtcc gaacattggc gaatatcgtg gcattggctt tatgtgggcg 1140
 ctggaaatcg tgaaagataa agcgagcaaa gcccgtttg atggcaacct gagcgtgagc 1200
 gaacgtattg cgaacacctg caccgatctg gggctgattt gccgtccgac aggccagagc 1260
 gtggttctgt gcccgcggtt tattctgacc gaagcgcaga tggatgaaat gttcgataaa 1320
 ctggaaaaag cgctggataa agtgtttagc gaagtggcg 1359

<210> 182
 <211> 453

<212> PRT

<213> Artificial Sequence

<220>

<223> Engineered variant of *V. fluvialis* transaminase

<400> 182

Met Asn Lys Pro Gln Ser Trp Glu Thr Arg Ala Glu Thr Tyr Ser Leu
 1 5 10 15

Tyr Gly Phe Thr Asp Met Pro Ser Leu His Gln Arg Gly Thr Met Val
 20 25 30

Val Ala His Gly Glu Gly Pro Tyr Ile Val Asp Val His Gly Arg Arg
 35 40 45

Tyr Leu Asp Ala Asn Ser Gly Ala Phe Asn Met Val Ala Gly Phe Asp
 50 55 60

His Lys Gly Leu Ile Asp Ala Ala Lys Ala Gln Tyr Glu Arg Phe Pro
 65 70 75 80

Gly Tyr His Ala Phe Ser Gly His Met Ser Asp Gln Thr Val Met Leu
 85 90 95

Ser Glu Lys Leu Val Glu Val Ser Pro Phe Asp Ser Gly Arg Val Phe
 100 105 110

Tyr Thr Asn Ser Gly Ser Glu Ala Asn Asp Thr Met Val Lys Met Leu
 115 120 125

Trp Phe Leu His Ala Ala Glu Gly Lys Pro Gln Lys Arg Lys Ile Leu
 130 135 140

Thr Arg His Asn Ala Tyr His Gly Cys Thr Val Val Ser Ala Ser Met
 145 150 155 160

Thr Gly Phe Pro Tyr Asn Ser Val Phe Gly Leu Pro Leu Pro Gly Phe
 165 170 175

Leu His Leu Thr Cys Pro His Tyr Trp Arg Tyr Gly Glu Glu Gly Glu
 180 185 190

Thr Glu Glu Gln Phe Val Ala Arg Leu Ala Arg Glu Leu Glu Glu Thr
 195 200 205

Ile Gln Lys Glu Gly Ala Asp Thr Ile Ala Gly Phe Phe Ala Glu Pro
 210 215 220

Val Met Gly Ala Gly Gly Val Ile Val Pro Ala Lys Gly Tyr Phe Gln
 225 230 235 240

CX2-126USP1_ST25

Ala Ile Leu Pro Ile Leu Arg Lys Tyr Asp Ile Pro Val Ile Ser Asp
245 250 255

Glu Val Ile Cys Gly Phe Gly Arg Thr Gly Asn Thr Trp Gly Cys Val
260 265 270

Thr Tyr Asp Phe Thr Pro Asp Ala Ile Ile Ser Ser Lys Asn Leu Thr
275 280 285

Ala Gly Phe Phe Pro Val Gly Ala Val Ile Leu Gly Pro Glu Leu Ser
290 295 300

Lys Arg Leu Glu Thr Ala Ile Glu Ala Ile Gly Ser Phe Pro His Gly
305 310 315 320

Phe Thr Thr Gly Gly His Pro Val Gly Cys Ala Ile Ala Leu Lys Ala
325 330 335

Ile Asp Val Val Met Asn Glu Gly Leu Ala Glu Asn Val Arg Arg Leu
340 345 350

Ala Pro Arg Phe Glu Glu Arg Leu Lys His Ile Ala Glu Arg Pro Asn
355 360 365

Ile Gly Glu Tyr Arg Gly Ile Gly Phe Met Trp Ala Leu Glu Ile Val
370 375 380

Lys Asp Lys Ala Ser Lys Ala Pro Phe Asp Gly Asn Leu Ser Val Ser
385 390 395 400

Glu Arg Ile Ala Asn Thr Cys Thr Asp Leu Gly Leu Ile Cys Arg Pro
405 410 415

Thr Gly Gln Ser Val Val Leu Cys Pro Pro Phe Ile Leu Thr Glu Ala
420 425 430

Gln Met Asp Glu Met Phe Asp Lys Leu Glu Lys Ala Leu Asp Lys Val
435 440 445

Phe Ser Glu Val Ala
450

<210> 183
<211> 1359
<212> DNA
<213> Artificial Sequence

<220>
<223> Engineered variant of v. fluvialis transaminase

<400> 183
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gatatgccga gcctgcatca gcgtggcacc atggtggtgg cccatggcga aggcccgat 120
Page 244

CX2-126USP1_ST25

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atcgtggatg tgcattggccg tcgttatctg gatgcgaaca gcggcgcttt caacatgggtg      180
gcggggctttg atcataaagg cctgattgat gcggcgaaaag cgcagtatga acgtttttccg      240
ggctatcatg cgtttttcagg ccatatgagc gatcagaccg tgatgctgtc tgaaaaactg      300
gtggaagtga gcccgtttga tagcggccgt gtgtttttata ccaacagcgg cagcgaagcg      360
aacgatacca tgggtgaaaat gctgtggttt ctgcatgcgg cggaaggcaa accgcaaaaa      420
cgtaaaattc tgacccgttg gaacgcgtat catggctgta ccgtagtgag cgcgagcatg      480
accggctttc cgtataacag cgtgtttggc ctgccgctgc cgggctttct gcatctgacc      540
tgcccgcatc attggcggtt tggcgaagaa ggcgaaaccg aagaacagtt tgtcgcgcgt      600
ctggcccgtg aactggaaga aaccattcag aagggaaggcg cggataccat tgcgggcttt      660
tttgcggaac cggatgatgg tgctggcggg gttattgtcc cggcgaaaagg ctattttcag      720
gcgattctgc cgatcctgcg caaatatgat attccgggtg tcagcgatga agtgatttgc      780
ggctttggcc gtaccggtaa cacctggggc tgcgtgacct atgattttac cccggatgcg      840
attattagca gtaaattgcct aaccgcgggt ttttttccgg taggcgcggg gattctgggt      900
ccggaactga gcaaactctt ggaaaccgcg attgaagcga tcggcaactt tccgaatggg      960
tttaccacgg gcggccatcc ggtggggttg gcgattgcgc tgaaagcgat tgatgtgggt      1020
atgaacgaag gcctggccga aaacgtgcgt cgtctggccc cgcgttttga agaactctg      1080
aaacatattg cggaaactcc gaacattggc gaatatcgtg gcattggctt tatgtgggcg      1140
ctggaaacgg tgaaagataa agcgagcaaa gccccgtttg atggcaacct gagcgtgagc      1200
gaacgtattg cgaacacctg caccgatctg ggcctgattt gccatccgac aggccagagc      1260
gtggttctgt gcccgcggtt tattctgacc gaagcgcaga tggatgaaat gttcgataaa      1320
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<210> 184

<211> 453

<212> PRT

<213> Artificial Sequence

<220>

<223> Engineered variant of V. fluvialis transaminase

<400> 184

Met Asn Lys Pro Gln Ser Trp Glu Thr Arg Ala Glu Thr Tyr Ser Leu
1 5 10 15

Tyr Gly Phe Thr Asp Met Pro Ser Leu His Gln Arg Gly Thr Met Val
20 25 30

Val Ala His Gly Glu Gly Pro Tyr Ile Val Asp Val His Gly Arg Arg
35 40 45

Tyr Leu Asp Ala Asn Ser Gly Ala Phe Asn Met Val Ala Gly Phe Asp
50 55 60

CX2-126USP1_ST25

His Lys Gly Leu Ile Asp Ala Ala Lys Ala Gln Tyr Glu Arg Phe Pro
 65 70 75 80
 Gly Tyr His Ala Phe Ser Gly His Met Ser Asp Gln Thr Val Met Leu
 85 90 95
 Ser Glu Lys Leu Val Glu Val Ser Pro Phe Asp Ser Gly Arg Val Phe
 100 105 110
 Tyr Thr Asn Ser Gly Ser Glu Ala Asn Asp Thr Met Val Lys Met Leu
 115 120 125
 Trp Phe Leu His Ala Ala Glu Gly Lys Pro Gln Lys Arg Lys Ile Leu
 130 135 140
 Thr Arg Trp Asn Ala Tyr His Gly Cys Thr Val Val Ser Ala Ser Met
 145 150 155 160
 Thr Gly Phe Pro Tyr Asn Ser Val Phe Gly Leu Pro Leu Pro Gly Phe
 165 170 175
 Leu His Leu Thr Cys Pro His Tyr Trp Arg Tyr Gly Glu Glu Gly Glu
 180 185 190
 Thr Glu Glu Gln Phe Val Ala Arg Leu Ala Arg Glu Leu Glu Glu Thr
 195 200 205
 Ile Gln Lys Glu Gly Ala Asp Thr Ile Ala Gly Phe Phe Ala Glu Pro
 210 215 220
 Val Met Gly Ala Gly Gly Val Ile Val Pro Ala Lys Gly Tyr Phe Gln
 225 230 235 240
 Ala Ile Leu Pro Ile Leu Arg Lys Tyr Asp Ile Pro Val Ile Ser Asp
 245 250 255
 Glu Val Ile Cys Gly Phe Gly Arg Thr Gly Asn Thr Trp Gly Cys Val
 260 265 270
 Thr Tyr Asp Phe Thr Pro Asp Ala Ile Ile Ser Ser Lys Cys Leu Thr
 275 280 285
 Ala Gly Phe Phe Pro Val Gly Ala Val Ile Leu Gly Pro Glu Leu Ser
 290 295 300
 Lys Arg Leu Glu Thr Ala Ile Glu Ala Ile Gly Asn Phe Pro Asn Gly
 305 310 315 320
 Phe Thr Thr Gly Gly His Pro Val Gly Cys Ala Ile Ala Leu Lys Ala
 325 330 335

CX2-126USP1_ST25

Ile Asp Val Val Met Asn Glu Gly Leu Ala Glu Asn Val Arg Arg Leu
340 345 350

Ala Pro Arg Phe Glu Glu Arg Leu Lys His Ile Ala Glu Arg Pro Asn
355 360 365

Ile Gly Glu Tyr Arg Gly Ile Gly Phe Met Trp Ala Leu Glu Thr Val
370 375 380

Lys Asp Lys Ala Ser Lys Ala Pro Phe Asp Gly Asn Leu Ser Val Ser
385 390 395 400

Glu Arg Ile Ala Asn Thr Cys Thr Asp Leu Gly Leu Ile Cys His Pro
405 410 415

Thr Gly Gln Ser Val Val Leu Cys Pro Pro Phe Ile Leu Thr Glu Ala
420 425 430

Gln Met Asp Glu Met Phe Asp Lys Leu Glu Lys Ala Leu Asp Lys Val
435 440 445

Phe Ala Glu Val Ala
450

<210> 185
<211> 1359
<212> DNA
<213> Artificial sequence

<220>
<223> Engineered variant of v. fluvialis transaminase

<400> 185
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atcgtggatg tgcattggcg tcgttatctg gatgcgaaca gcggcgcttt caacatggtg 180
gcgggctttg atcataaagg cctgattgat gcggcgaaag cgcagtatga acgtttttccg 240
ggctatcatg cgtttttcagg ccatatgagc gatcagaccg tgatgctgtc tgaaaaactg 300
gtggaagtga gcccgtttga tagcggccgt gtgtttttgta ccaacagcgg cagcgaagcg 360
aacgatacca tgggtgaaaat gctgtggttt ctgcatgcgg cggaaggcaa accgcaaaaa 420
cgtaaaattc tgaccggttg gaacgcgtat catggctgta ccgtagtgag cgcgagcatg 480
accggctttc cgtataacag cgtgtttggc ctgccgctgc cgggctttct gcatctgacc 540
tgcccgcatt attggcggtta tggcgaagaa ggcgaaaccg aagaacagtt tgtcgcgcgt 600
ctggcccgtg aactggaaga aaccattcag aagggaaggcg cggataccat tgcgggcttt 660
tttgcggaac cgggtgatggg tgctggcggg gttattccgc cggcgaaagg ctattttcag 720
gcgattctgc cgatcctgcg caaatatgat attccgggtga tcagcgatga agtgattttgc 780

CX2-126USP1_ST25

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tttaccgcgg gcggccatcc ggtgggttgt gcgattgcgc tgaaagcgat tgatgtggtg 1020
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aaacatattg cggaacgtcc gaacattggc gaatatcgtg gcattggctt tatgtgggcg 1140
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gaacgtattg cgaacacctg caccgatctg ggcttgattt gccatccgac aggccagagc 1260
gtggttctgt gcccgcggtt tattctgacc gaagcgcaga tggatgaaat gttcgataaa 1320
ctggaaaaag cgctggataa agtgtttgcg gaagtggcg 1359

<210> 186

<211> 453

<212> PRT

<213> Artificial Sequence

<220>

<223> Engineered variant of V. fluvialis transaminase

<400> 186

Met Asn Lys Pro Gln Ser Trp Glu Thr Arg Ala Glu Thr Tyr Ser Leu
1 5 10 15

Tyr Gly Phe Thr Asp Met Pro Ser Leu His Gln Arg Gly Thr Met Val
20 25 30

Val Ala His Gly Glu Gly Pro Tyr Ile Val Asp Val His Gly Arg Arg
35 40 45

Tyr Leu Asp Ala Asn Ser Gly Ala Phe Asn Met Val Ala Gly Phe Asp
50 55 60

His Lys Gly Leu Ile Asp Ala Ala Lys Ala Gln Tyr Glu Arg Phe Pro
65 70 75 80

Gly Tyr His Ala Phe Ser Gly His Met Ser Asp Gln Thr Val Met Leu
85 90 95

Ser Glu Lys Leu Val Glu Val Ser Pro Phe Asp Ser Gly Arg Val Phe
100 105 110

Cys Thr Asn Ser Gly Ser Glu Ala Asn Asp Thr Met Val Lys Met Leu
115 120 125

Trp Phe Leu His Ala Ala Glu Gly Lys Pro Gln Lys Arg Lys Ile Leu
130 135 140

CX2-126USP1_ST25

Thr Arg Trp Asn Ala Tyr His Gly Cys Thr Val Val Ser Ala Ser Met
 145 150 155 160
 Thr Gly Phe Pro Tyr Asn Ser Val Phe Gly Leu Pro Leu Pro Gly Phe
 165 170 175
 Leu His Leu Thr Cys Pro His Tyr Trp Arg Tyr Gly Glu Glu Gly Glu
 180 185 190
 Thr Glu Glu Gln Phe Val Ala Arg Leu Ala Arg Glu Leu Glu Glu Thr
 195 200 205
 Ile Gln Lys Glu Gly Ala Asp Thr Ile Ala Gly Phe Phe Ala Glu Pro
 210 215 220
 Val Met Gly Ala Gly Gly Val Ile Pro Pro Ala Lys Gly Tyr Phe Gln
 225 230 235 240
 Ala Ile Leu Pro Ile Leu Arg Lys Tyr Asp Ile Pro Val Ile Ser Asp
 245 250 255
 Glu Val Ile Cys Gly Phe Gly Arg Thr Gly Asn Thr Trp Gly Cys Val
 260 265 270
 Thr Tyr Asp Phe Thr Pro Asp Ala Ile Ile Ser Ser Lys Asn Leu Thr
 275 280 285
 Ala Gly Phe Phe Pro Val Gly Ala Val Ile Leu Gly Pro Glu Leu Ser
 290 295 300
 Lys Arg Leu Glu Thr Ala Ile Glu Ala Ile Gly Asn Phe Pro His Gly
 305 310 315 320
 Phe Thr Ala Gly Gly His Pro Val Gly Cys Ala Ile Ala Leu Lys Ala
 325 330 335
 Ile Asp Val Val Met Asn Glu Gly Leu Ala Glu Asn Val Arg Arg Leu
 340 345 350
 Ala Pro Arg Phe Glu Glu Arg Leu Lys His Ile Ala Glu Arg Pro Asn
 355 360 365
 Ile Gly Glu Tyr Arg Gly Ile Gly Phe Met Trp Ala Leu Glu Ala Val
 370 375 380
 Lys Asp Lys Ala Ser Lys Ala Pro Phe Asp Gly Asn Leu Ser Val Ser
 385 390 395 400
 Glu Arg Ile Ala Asn Thr Cys Thr Asp Leu Gly Leu Ile Cys His Pro
 405 410 415

CX2-126USP1_ST25

Thr Gly Gln Ser Val Val Leu Cys Pro Pro Phe Ile Leu Thr Glu Ala
420 425 430

Gln Met Asp Glu Met Phe Asp Lys Leu Glu Lys Ala Leu Asp Lys Val
435 440 445

Phe Ala Glu Val Ala
450

<210> 187
<211> 1359
<212> DNA
<213> Artificial Sequence

<220>
<223> Engineered variant of *V. fluvialis* transaminase

<400> 187
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gatatgccga gcctgcatca gcgtggcacc atggtggtgg cccatggcga aggcccgat 120
atcgtggatg tgcattggcg tcgttatctg gatgcgaaca gcggcgcttt caacatggtg 180
gcgggctttg atcataaagg cctgattgat gcggcgaaaag cgcagtatga acgttttccg 240
ggctatcatg cgttttcagg ccatatgagc gatcagaccg tgatgctgtc tgaaaaactg 300
gtggaagtga gcccgtttga tagcggccgt gtgttttata ccaacagcgg cagcgaagcg 360
aacgatacca tgggtgaaaat gctgtggttt ctgcatgcgg cggaaggcaa accgcaaaaa 420
cgtaaaattc tgacccgtca caacgcgtat catggctgta ccgtagtgag cgcgagcatg 480
accggctttc cgtataacag cgtgtttggc ctgccgctgc cgggctttct gcatctgacc 540
tgcccgcatc attggcggtt tggcgaagaa ggcgaaaccg aagaacagtt tgcgcgcgt 600
ctggcccgtg aactggaaga aaccattcag aagggaaggcg cggataccat tgcgggcttt 660
tttgcggaac cggatgatgg tgctggcggg gttattccgc cggcgaaagg ctattttcag 720
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gaacgtattg cgaacacctg caccgatctg ggcttgattt gccgtccgac aggccagagc 1260
gtggttctgt gcccgcggtt tattctgacc gaagcgcaga tggatgaaat gttcgataaa 1320
ctggaaaaag cgctggataa agtgtttgcg gaagtggcg 1359

CX2-126USP1_ST25

<210> 188
 <211> 453
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> Engineered variant of *V. fluvialis* transaminase

<400> 188

Met Asn Lys Pro Gln Ser Trp Glu Thr Arg Ala Glu Thr Tyr Ser Leu
 1 5 10 15

Tyr Gly Phe Thr Asp Met Pro Ser Leu His Gln Arg Gly Thr Met Val
 20 25 30

Val Ala His Gly Glu Gly Pro Tyr Ile Val Asp Val His Gly Arg Arg
 35 40 45

Tyr Leu Asp Ala Asn Ser Gly Ala Phe Asn Met Val Ala Gly Phe Asp
 50 55 60

His Lys Gly Leu Ile Asp Ala Ala Lys Ala Gln Tyr Glu Arg Phe Pro
 65 70 75 80

Gly Tyr His Ala Phe Ser Gly His Met Ser Asp Gln Thr Val Met Leu
 85 90 95

Ser Glu Lys Leu Val Glu Val Ser Pro Phe Asp Ser Gly Arg Val Phe
 100 105 110

Tyr Thr Asn Ser Gly Ser Glu Ala Asn Asp Thr Met Val Lys Met Leu
 115 120 125

Trp Phe Leu His Ala Ala Glu Gly Lys Pro Gln Lys Arg Lys Ile Leu
 130 135 140

Thr Arg His Asn Ala Tyr His Gly Cys Thr Val Val Ser Ala Ser Met
 145 150 155 160

Thr Gly Phe Pro Tyr Asn Ser Val Phe Gly Leu Pro Leu Pro Gly Phe
 165 170 175

Leu His Leu Thr Cys Pro His Tyr Trp Arg Tyr Gly Glu Glu Gly Glu
 180 185 190

Thr Glu Glu Gln Phe Val Ala Arg Leu Ala Arg Glu Leu Glu Glu Thr
 195 200 205

Ile Gln Lys Glu Gly Ala Asp Thr Ile Ala Gly Phe Phe Ala Glu Pro
 210 215 220

Val Met Gly Ala Gly Gly Val Ile Pro Pro Ala Lys Gly Tyr Phe Gln
 225 230 235 240

CX2-126USP1_ST25

Ala Ile Leu Pro Ile Leu Arg Lys Tyr Asp Ile Pro Val Ile Ser Asp
245 250 255

Glu Val Ile Cys Gly Phe Gly Arg Thr Gly Asn Thr Trp Gly Cys Val
260 265 270

Thr Tyr Asp Phe Thr Pro Asp Ala Ile Ile Ser Ser Lys Asn Leu Thr
275 280 285

Ala Gly Phe Phe Pro Val Gly Ala Val Ile Leu Gly Pro Glu Leu Ser
290 295 300

Lys Arg Leu Glu Thr Ala Ile Glu Ala Ile Gly Asn Phe Pro His Gly
305 310 315 320

Phe Thr Ala Gly Gly His Pro Val Gly Cys Ala Ile Ala Leu Lys Ala
325 330 335

Ile Asp Val Val Met Asn Glu Gly Leu Ala Glu Asn Val Arg Arg Leu
340 345 350

Ala Pro Arg Phe Glu Glu Arg Leu Lys His Ile Ala Glu Arg Pro Asn
355 360 365

Ile Gly Glu Tyr Arg Gly Ile Gly Phe Met Trp Ala Leu Glu Ile Val
370 375 380

Lys Asp Lys Ala Ser Lys Ala Pro Phe Asp Gly Asn Leu Ser Val Ser
385 390 395 400

Glu Arg Ile Ala Asn Thr Cys Thr Asp Leu Gly Leu Ile Cys Arg Pro
405 410 415

Thr Gly Gln Ser Val Val Leu Cys Pro Pro Phe Ile Leu Thr Glu Ala
420 425 430

Gln Met Asp Glu Met Phe Asp Lys Leu Glu Lys Ala Leu Asp Lys Val
435 440 445

Phe Ala Glu Val Ala
450

<210> 189
<211> 1359
<212> DNA
<213> Artificial Sequence

<220>
<223> Engineered variant of v. fluvialis transaminase

<400> 189
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Page 252

CX2-126USP1_ST25

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atcgtggatg tgcattggccg tcgttatctg gatgcgaaca gcggcgcttt caacatggtg 180
gcgggctttg atcataaagg cctgattgat gcggcgaaaag cgcagtatga acgttttccg 240
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accggctttc cgtataacag cgtgtttggc ctgccgctgc cgggctttct gcatctgacc 540
tgcccgcatt attggcggtt tggcgaagaa ggcgaaaccg aagaacagtt tgtcgcgcgt 600
ctggcccgtg aactggaaga aaccattcag aaggaaggcg cggataccat tgcgggcttt 660
tttgcggaac cgggtgatggg tgctggcggg gttattgtcc cggcgaaaagg ctattttcag 720
gcgattctgc cgatcctgcg caaatatgat attccggtga tcagcgatga agtgatttgc 780
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tttaccacgg gcggccatcc ggtgggttgt gcgattgcgc tgaaagcgat tgatgtggtg 1020
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aaacatattg cggaacgtcc gaacattggc gaatatcgtg gcattggctt tatgtgggcg 1140
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gaacgtattg cgaacacctg caccgatctg ggctgattt gccgtccgac aggccagagc 1260
gtggttctgt gcccgcggtt tattctgacc gaagcgcaga tggatgaaat gttcgataaa 1320
ctggaaaaag cgctggataa agtggttagc gaagtggcg 1359

<210> 190
<211> 453
<212> PRT
<213> Artificial Sequence

<220>
<223> Engineered variant of V. fluvialis transaminase
<400> 190

Met Asn Lys Pro Gln Ser Trp Glu Thr Arg Ala Glu Thr Tyr Ser Leu
1 5 10 15

Tyr Gly Phe Thr Asp Met Pro Ser Leu His Gln Arg Gly Thr Met Val
20 25 30

Val Ala His Gly Glu Gly Pro Tyr Ile Val Asp Val His Gly Arg Arg
35 40 45

CX2-126USP1_ST25

Tyr Leu Asp Ala Asn Ser Gly Ala Phe Asn Met Val Ala Gly Phe Asp
 50 55 60
 His Lys Gly Leu Ile Asp Ala Ala Lys Ala Gln Tyr Glu Arg Phe Pro
 65 70 75 80
 Gly Tyr His Ala Phe Ser Gly His Met Ser Asp Gln Thr Val Met Leu
 85 90 95
 Ser Glu Lys Leu Val Glu Val Ser Pro Phe Asp Ser Gly Arg Val Phe
 100 105 110
 Tyr Thr Asn Ser Gly Ser Glu Ala Asn Asp Thr Met Val Lys Met Leu
 115 120 125
 Trp Phe Leu His Ala Ala Glu Gly Lys Pro Gln Lys Arg Lys Ile Leu
 130 135 140
 Thr Arg Val Asn Ala Tyr His Gly Cys Thr Val Val Ser Ala Ser Met
 145 150 155 160
 Thr Gly Phe Pro Tyr Asn Ser Val Phe Gly Leu Pro Leu Pro Gly Phe
 165 170 175
 Leu His Leu Thr Cys Pro His Tyr Trp Arg Tyr Gly Glu Glu Gly Glu
 180 185 190
 Thr Glu Glu Gln Phe Val Ala Arg Leu Ala Arg Glu Leu Glu Glu Thr
 195 200 205
 Ile Gln Lys Glu Gly Ala Asp Thr Ile Ala Gly Phe Phe Ala Glu Pro
 210 215 220
 Val Met Gly Ala Gly Gly Val Ile Val Pro Ala Lys Gly Tyr Phe Gln
 225 230 235 240
 Ala Ile Leu Pro Ile Leu Arg Lys Tyr Asp Ile Pro Val Ile Ser Asp
 245 250 255
 Glu Val Ile Cys Gly Phe Gly Arg Thr Gly Asn Thr Trp Gly Cys Val
 260 265 270
 Thr Tyr Asp Phe Thr Pro Asp Ala Ile Ile Ser Ser Lys Cys Leu Thr
 275 280 285
 Ala Gly Phe Phe Pro Val Gly Ala Val Ile Leu Gly Pro Glu Leu Ser
 290 295 300
 Lys Arg Leu Glu Thr Ala Ile Glu Ala Ile Gly Asn Phe Pro His Gly
 305 310 315 320

CX2-126USP1_ST25

Phe Thr Thr Gly Gly His Pro Val Gly Cys Ala Ile Ala Leu Lys Ala
325 330 335

Ile Asp Val Val Met Asn Glu Gly Leu Ala Glu Asn Val Arg Arg Leu
340 345 350

Ala Pro Arg Phe Glu Glu Arg Leu Lys His Ile Ala Glu Arg Pro Asn
355 360 365

Ile Gly Glu Tyr Arg Gly Ile Gly Phe Met Trp Ala Leu Glu Met Val
370 375 380

Lys Asp Lys Ala Ser Lys Ala Pro Phe Asp Gly Asn Leu Ser Val Ser
385 390 395 400

Glu Arg Ile Ala Asn Thr Cys Thr Asp Leu Gly Leu Ile Cys Arg Pro
405 410 415

Thr Gly Gln Ser Val Val Leu Cys Pro Pro Phe Ile Leu Thr Glu Ala
420 425 430

Gln Met Asp Glu Met Phe Asp Lys Leu Glu Lys Ala Leu Asp Lys Val
435 440 445

Phe Ser Glu Val Ala
450

<210> 191
<211> 1359
<212> DNA
<213> Artificial Sequence

<220>
<223> Engineered variant of V. fluvialis transaminase

<400> 191
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gcgggctttg atcataaagg cctgattgat gcggcgaaag cgcagtatga acgttttccg 240
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cgtaaaattc tgaccggtt gaacgcgtat catggctgta ccgtagtgag cgcgagcatg 480
accggctttc cgtataacag cgtgtttggc ctgccgctgc cgggctttct gcatctgacc 540
tgcccgcat attggcggtta tggcgaagaa ggcgaaaccg aagaacagtt tgtcgcgcgt 600
ctggcccgtg aactggaaga aaccattcag aagggaaggcg cggataccat tgcgggcttt 660
tttgcggaac cgggtgatggg tgctggcggg gttattgtcc cggcgaaagg ctattttcag 720

CX2-126USP1_ST25

gcgattctgc cgatcctgcg caaatatgat attccggtga tcagcgatga agtgatttgc 780
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 ccggaactga gcaaactgtt ggaaaccgcg attgaagcga tcggcaactt gccgcatggt 960
 tttaccacgg gcggccatcc ggtgggttgt gcgattgcgc tgaaagcgat tgatgtggtg 1020
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<210> 192
 <211> 453
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> Engineered variant of V. fluvialis transaminase
 <400> 192

Met Asn Lys Pro Gln Ser Trp Glu Thr Arg Ala Glu Thr Tyr Ser Leu
 1 5 10 15

Tyr Gly Phe Thr Asp Met Pro Ser Leu His Gln Arg Gly Thr Met Val
 20 25 30

Val Ala His Gly Glu Gly Pro Tyr Ile Val Asp Val His Gly Arg Arg
 35 40 45

Tyr Leu Asp Ala Asn Ser Gly Ala Phe Asn Met Val Ala Gly Phe Asp
 50 55 60

His Lys Gly Leu Ile Asp Ala Ala Lys Ala Gln Tyr Glu Arg Phe Pro
 65 70 75 80

Gly Tyr His Ala Phe Ser Gly His Met Ser Asp Gln Thr Val Met Leu
 85 90 95

Ser Glu Lys Leu Val Glu Val Ser Pro Phe Asp Ser Gly Arg Val Phe
 100 105 110

Tyr Thr Asn Ser Gly Ser Glu Ala Asn Asp Thr Met Val Lys Met Leu
 115 120 125

Trp Phe Leu His Ala Ala Glu Gly Lys Pro Gln Lys Arg Lys Ile Leu
 130 135 140

CX2-126USP1_ST25

Thr Arg Trp Asn Ala Tyr His Gly Cys Thr Val Val Ser Ala Ser Met
 145 150 155 160
 Thr Gly Phe Pro Tyr Asn Ser Val Phe Gly Leu Pro Leu Pro Gly Phe
 165 170 175
 Leu His Leu Thr Cys Pro His Tyr Trp Arg Tyr Gly Glu Glu Gly Glu
 180 185 190
 Thr Glu Glu Gln Phe Val Ala Arg Leu Ala Arg Glu Leu Glu Glu Thr
 195 200 205
 Ile Gln Lys Glu Gly Ala Asp Thr Ile Ala Gly Phe Phe Ala Glu Pro
 210 215 220
 Val Met Gly Ala Gly Gly Val Ile Val Pro Ala Lys Gly Tyr Phe Gln
 225 230 235 240
 Ala Ile Leu Pro Ile Leu Arg Lys Tyr Asp Ile Pro Val Ile Ser Asp
 245 250 255
 Glu Val Ile Cys Gly Phe Gly Arg Thr Gly Asn Thr Trp Gly Cys Val
 260 265 270
 Thr Tyr Asp Phe Thr Pro Asp Ala Ile Ile Ser Ser Lys Asn Leu Thr
 275 280 285
 Ala Gly Phe Phe Pro Val Gly Ala Val Ile Leu Gly Pro Glu Leu Ser
 290 295 300
 Lys Arg Leu Glu Thr Ala Ile Glu Ala Ile Gly Asn Leu Pro His Gly
 305 310 315 320
 Phe Thr Thr Gly Gly His Pro Val Gly Cys Ala Ile Ala Leu Lys Ala
 325 330 335
 Ile Asp Val Val Met Asn Glu Gly Leu Ala Glu Asn Val Arg Arg Leu
 340 345 350
 Ala Pro Arg Phe Glu Glu Arg Leu Lys His Ile Ala Glu Arg Pro Asn
 355 360 365
 Ile Gly Glu Tyr Arg Gly Ile Gly Phe Met Trp Ala Leu Glu Val Val
 370 375 380
 Lys Asp Lys Ala Ser Lys Ala Pro Phe Asp Gly Asn Leu Ser Val Ser
 385 390 395 400
 Glu Arg Ile Ala Asn Thr Cys Thr Asp Leu Gly Leu Ile Cys His Pro
 405 410 415

CX2-126USP1_ST25

Thr Gly Gln Ser Val Val Leu Cys Pro Pro Phe Ile Leu Thr Glu Ala
420 425 430

Gln Met Asp Glu Met Phe Asp Lys Leu Glu Lys Ala Leu Asp Lys Val
435 440 445

Phe Ala Glu Val Ala
450

<210> 193
<211> 1359
<212> DNA
<213> Artificial Sequence

<220>
<223> Engineered variant of *V. fluvialis* transaminase

<400> 193
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ggctatcatg cgttttgcgg ctatatgagc gatcagaccg tgatgctgtc tgaaaaactg 300
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accggctttc cgttcaacag cgtgtttggc ctgccgctgc cgggctttct gcatctgacc 540
tgcccgcatt attggcggtt tggcgaagaa ggcgaaaccg aagaacagtt tgtcgcgcgt 600
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aaacatattg cggaacatcc gaacattggc gaatatcgtg gcattggctt tatgtgggcg 1140
ctggaagttg tgaaagataa agcgagcaaa gccccgtttg atggcaacct gagcgtgagc 1200
gaacgtattg cgaacacctg caccgatctg ggcctgattt gccgtccgac aggccagagc 1260
gtggttctgg ctccgccgtt cattctgacc gaagcgcaga tggatgaaat gttcgataaa 1320
ctggaaaaag cgctggataa agtgtttgcg gaagtggcg 1359

<210> 194
 <211> 453
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> Engineered variant of *V. fluvialis* transaminase

<400> 194

Met Asn Lys Pro Gln Ser Trp Glu Thr Arg Ala Glu Thr Tyr Ser Leu
 1 5 10 15

Tyr Gly Phe Thr Asp Met Pro Ser Leu His Gln Arg Gly Thr Met Val
 20 25 30

Val Ala His Gly Glu Gly Pro Tyr Ile Val Asp Val His Gly Arg Arg
 35 40 45

Tyr Leu Asp Ala Met Ser Gly Ala Phe Asn Met Val Ala Gly Phe Asp
 50 55 60

His Lys Gly Leu Ile Asp Ala Ala Lys Ala Gln Tyr Glu Arg Phe Pro
 65 70 75 80

Gly Tyr His Ala Phe Cys Gly Tyr Met Ser Asp Gln Thr Val Met Leu
 85 90 95

Ser Glu Lys Leu Val Glu Val Ser Pro Phe Asp Ser Gly Arg Val Phe
 100 105 110

Tyr Thr Asn Ser Gly Ser Glu Ala Asn Asp Thr Met Val Lys Met Leu
 115 120 125

Trp Phe Leu His Ala Ala Glu Gly Lys Pro Gln Lys Arg Lys Ile Leu
 130 135 140

Thr Leu Trp Asn Ala Tyr His Gly Cys Thr Val Val Ser Ala Ser Met
 145 150 155 160

Thr Gly Phe Pro Phe Asn Ser Val Phe Gly Leu Pro Leu Pro Gly Phe
 165 170 175

Leu His Leu Thr Cys Pro His Tyr Trp Arg Tyr Gly Glu Glu Gly Glu
 180 185 190

Thr Glu Glu Gln Phe Val Ala Arg Leu Ala Arg Glu Leu Glu Glu Thr
 195 200 205

Ile Gln Lys Glu Gly Ala Asp Thr Ile Ala Gly Phe Phe Ala Glu Pro
 210 215 220

CX2-126USP1_ST25

Val Met Gly Ala Gly Gly Val Ile Pro Pro Ala Lys Gly Tyr Phe Gln
225 230 235 240

Ala Ile Leu Pro Ile Leu Arg Lys Tyr Asp Ile Pro Val Ile Ser Asp
245 250 255

Glu Val Val Cys Gly Phe Gly Arg Thr Gly Asn Thr Trp Gly Cys Val
260 265 270

Thr Tyr Asp Phe Thr Pro Asp Ala Ile Ile Ser Ser Lys Asn Leu Thr
275 280 285

Ala Gly Phe Phe Pro Val Gly Ala Val Ile Leu Gly Pro Glu Leu Ser
290 295 300

Lys Arg Leu Glu Thr Ala Ile Glu Ala Ile Gly Glu Phe Pro His Gly
305 310 315 320

Phe Thr Ala Gly Gly His Pro Val Gly Cys Ala Ile Ala Leu Lys Ala
325 330 335

Ile Asp Val Val Met Asn Glu Gly Leu Ala Glu Asn Val Arg Arg Leu
340 345 350

Ala Pro Arg Phe Glu Glu Arg Leu Lys His Ile Ala Glu His Pro Asn
355 360 365

Ile Gly Glu Tyr Arg Gly Ile Gly Phe Met Trp Ala Leu Glu Val Val
370 375 380

Lys Asp Lys Ala Ser Lys Ala Pro Phe Asp Gly Asn Leu Ser Val Ser
385 390 395 400

Glu Arg Ile Ala Asn Thr Cys Thr Asp Leu Gly Leu Ile Cys Arg Pro
405 410 415

Thr Gly Gln Ser Val Val Leu Ala Pro Pro Phe Ile Leu Thr Glu Ala
420 425 430

Gln Met Asp Glu Met Phe Asp Lys Leu Glu Lys Ala Leu Asp Lys Val
435 440 445

Phe Ala Glu Val Ala
450

<210> 195
<211> 1359
<212> DNA
<213> Artificial sequence

<220>
<223> Engineered variant of v. fluvialis transaminase

CX2-126USP1_ST25

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<400> 195
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atcgtggatg tgcattggccg tcgttatctg gatgcgatga gcggcgcttt caacatggtg      180
gcgggctttg atcataaagg cctgattgat gcggcgaaaag cgcagtatga acgttttccg      240
ggctatcatg cgttttgcgg ctatatgagc gatcagaccg tgatgctgtc tgaaaaactg      300
gtggaagtga gcccgtttga tagcggccgt gtgttttata ccaacagcgg cagcgaagcg      360
aacgatacca tgggtgaaaat gctgtggttt ctgcatgcgg cggaaggcaa accgcagaaa      420
cgtaaaattc tgacctgtg gaacgcgtat catggcgtga ccgtagtgag cgcgagcatg      480
accggctttc cgttcaacag cgtgtttggc ctgccgctgc cgggctttct gcatctgacc      540
tgcccgcatc attggcgta tggcgaagaa ggcgaaaccg aagaacagtt tgcgcgcgt      600
ctggcccgtg aactggaaga aaccattcag aagggaaggc cgataccat tgcgggcttt      660
tttgcggaac cgggtgatggg tgctggcggg gttattccgc cggcgaaagg ctattttcag      720
gcgattctgc cgatcctgcg caaatatgat attccggtga tcagcgatga agtgggtgtgc      780
ggctttggcc gtaccggtaa cacctggggc tgcgtgacct atgattttac cccggatgcg      840
attattagca gtaaaaacct aaccgcgggt ttttttccgg taggcgcggg gattctgggt      900
ccggaactga gcaaactgtc ggaaaccgcg attaatgcga acggcgaatt tccgcatggt      960
tttaccgcgg gcggccatcc ggtgggttgt gcgattgcgc tgaaagcgat tgatgtggtg     1020
atgaacgaag gcctggccga aaacgtgcgt cgtctggccc cgcgttttga agaactgtct     1080
aaacatattg cggaacatcc gaacattggc gaatatcgtg gcattggctt tatgtgggcg     1140
ctggaagtgt tgaaagataa agcgagcaaa gccccgtttg atggcaacct gagcgtgagc     1200
gaacgtattg cgaacacctg caccgatctg ggcctgattt gccgtccgac aggccagagc     1260
gtggttctgg ctccgccgtt cattctgacc gaagcgcaga tggatgaaat gttcgataaa     1320
ctggaaaaag cgctggataa agtgtttgcg gaagtggcg      1359

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<210> 196

<211> 453

<212> PRT

<213> Artificial Sequence

<220>

<223> Engineered variant of V. fluvialis transaminase

<400> 196

Met Asn Lys Pro Gln Ser Trp Glu Thr Arg Ala Glu Thr Tyr Ser Leu
1 5 10 15

Tyr Gly Phe Thr Asp Met Pro Ser Leu His Gln Arg Gly Thr Val Val
20 25 30

Val Ala His Gly Glu Gly Pro Tyr Ile Val Asp Val His Gly Arg Arg
35 40 45

CX2-126USP1_ST25

Tyr Leu Asp Ala Met Ser Gly Ala Phe Asn Met Val Ala Gly Phe Asp
 50 55 60
 His Lys Gly Leu Ile Asp Ala Ala Lys Ala Gln Tyr Glu Arg Phe Pro
 65 70 75 80
 Gly Tyr His Ala Phe Cys Gly Tyr Met Ser Asp Gln Thr Val Met Leu
 85 90 95
 Ser Glu Lys Leu Val Glu Val Ser Pro Phe Asp Ser Gly Arg Val Phe
 100 105 110
 Tyr Thr Asn Ser Gly Ser Glu Ala Asn Asp Thr Met Val Lys Met Leu
 115 120 125
 Trp Phe Leu His Ala Ala Glu Gly Lys Pro Gln Lys Arg Lys Ile Leu
 130 135 140
 Thr Leu Trp Asn Ala Tyr His Gly Val Thr Val Val Ser Ala Ser Met
 145 150 155 160
 Thr Gly Phe Pro Phe Asn Ser Val Phe Gly Leu Pro Leu Pro Gly Phe
 165 170 175
 Leu His Leu Thr Cys Pro His Tyr Trp Arg Tyr Gly Glu Glu Gly Glu
 180 185 190
 Thr Glu Glu Gln Phe Val Ala Arg Leu Ala Arg Glu Leu Glu Glu Thr
 195 200 205
 Ile Gln Lys Glu Gly Ala Asp Thr Ile Ala Gly Phe Phe Ala Glu Pro
 210 215 220
 Val Met Gly Ala Gly Gly Val Ile Pro Pro Ala Lys Gly Tyr Phe Gln
 225 230 235 240
 Ala Ile Leu Pro Ile Leu Arg Lys Tyr Asp Ile Pro Val Ile Ser Asp
 245 250 255
 Glu Val Val Cys Gly Phe Gly Arg Thr Gly Asn Thr Trp Gly Cys Val
 260 265 270
 Thr Tyr Asp Phe Thr Pro Asp Ala Ile Ile Ser Ser Lys Asn Leu Thr
 275 280 285
 Ala Gly Phe Phe Pro Val Gly Ala Val Ile Leu Gly Pro Glu Leu Ser
 290 295 300
 Lys Arg Leu Glu Thr Ala Ile Asn Ala Asn Gly Glu Phe Pro His Gly
 305 310 315 320

CX2-126USP1_ST25

Phe Thr Ala Gly Gly His Pro Val Gly Cys Ala Ile Ala Leu Lys Ala
325 330 335

Ile Asp Val Val Met Asn Glu Gly Leu Ala Glu Asn Val Arg Arg Leu
340 345 350

Ala Pro Arg Phe Glu Glu Arg Leu Lys His Ile Ala Glu His Pro Asn
355 360 365

Ile Gly Glu Tyr Arg Gly Ile Gly Phe Met Trp Ala Leu Glu Val Val
370 375 380

Lys Asp Lys Ala Ser Lys Ala Pro Phe Asp Gly Asn Leu Ser Val Ser
385 390 395 400

Glu Arg Ile Ala Asn Thr Cys Thr Asp Leu Gly Leu Ile Cys Arg Pro
405 410 415

Thr Gly Gln Ser Val Val Leu Ala Pro Pro Phe Ile Leu Thr Glu Ala
420 425 430

Gln Met Asp Glu Met Phe Asp Lys Leu Glu Lys Ala Leu Asp Lys Val
435 440 445

Phe Ala Glu Val Ala
450

<210> 197
<211> 1359
<212> DNA
<213> Artificial Sequence

<220>
<223> Engineered variant of V. fluvialis transaminase

<400> 197	
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atcgtggatg tgcattgccc tcgttatctg gatgcgatga gcggcgcttt caacatggtg	180
gcgggctttg atcataaagg cctgattgat gcggcgaaaag cgcagtatga acgttttccg	240
ggctatcatg cgttttgcgg ctatatgagc gatcagaccg tgatgctgtc tgaaaaactg	300
gtggaagtga gcccgtttga tagcggccgt gtgttttata ccaacagcgg cagcgaagcg	360
aacgatacca tgggtgaaaat gctgtggttt ctgcatgcgg cggaaggcaa accgcagaaa	420
cgtaaaattc tgacctgtg gaacgcgtat catggctgca ccgtagtgag cgcgagcatg	480
accggctttc cgttcaacag cgtgtttggc ctgccgctgc cgggctttct gcatctgacc	540
tgccgcatt attggcgta tggcgaagaa ggcgaaaccg aagaacagtt tgtcgcgcgt	600
ctggcccgtg aactggaaga aaccattcag aagggaaggcg cgataccat tgcgggcttt	660

CX2-126USP1_ST25

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tttgcggaac cggatgatggg tgctggcggg gttattccgc cggcgaaagg ctattttcag      720
gcgattctgc cgatcctgcg caaatatgat attccgggtga tcagcgatga agtggtgtgc      780
ggcttttgcc gtaccggtaa cacctggggc tgcgtgacct atgattttac cccggatgcg      840
attattagca gtaaaaacct aaccgcgggt ttttttccgg taggcgcggg gattctgggt      900
ccggaactga gcaaactgtc ggaaaccgcg attgaagcga tcggcgaatt tccgcatggg      960
tttaccgcgg gcggccatcc ggtgggttgt gcgattgcgc tgaaagcgat tgatgtgggt     1020
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gaacgtattg cgaacacctg caccgatctg ggcctgattt gccgtccgac aggccagagc      1260
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ctggaaaaag cgctggataa agtgtttgcg gaagtggcg      1359

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<210> 198
 <211> 453
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> Engineered variant of V. fluvialis transaminase
 <400> 198

Met Asn Lys Pro Gln Ser Trp Glu Thr Arg Ala Glu Thr Tyr Ser Leu
 1 5 10 15

Tyr Gly Phe Thr Asp Met Pro Ser Leu His Gln Arg Gly Thr Val Val
 20 25 30

Val Ala His Gly Glu Gly Pro Tyr Ile Val Asp Val His Gly Arg Arg
 35 40 45

Tyr Leu Asp Ala Met Ser Gly Ala Phe Asn Met Val Ala Gly Phe Asp
 50 55 60

His Lys Gly Leu Ile Asp Ala Ala Lys Ala Gln Tyr Glu Arg Phe Pro
 65 70 75 80

Gly Tyr His Ala Phe Cys Gly Tyr Met Ser Asp Gln Thr Val Met Leu
 85 90 95

Ser Glu Lys Leu Val Glu Val Ser Pro Phe Asp Ser Gly Arg Val Phe
 100 105 110

Tyr Thr Asn Ser Gly Ser Glu Ala Asn Asp Thr Met Val Lys Met Leu
 115 120 125

CX2-126USP1_ST25

Trp Phe Leu His Ala Ala Glu Gly Lys Pro Gln Lys Arg Lys Ile Leu
130 135 140

Thr Leu Trp Asn Ala Tyr His Gly Cys Thr Val Val Ser Ala Ser Met
145 150 155 160

Thr Gly Phe Pro Phe Asn Ser Val Phe Gly Leu Pro Leu Pro Gly Phe
165 170 175

Leu His Leu Thr Cys Pro His Tyr Trp Arg Tyr Gly Glu Glu Gly Glu
180 185 190

Thr Glu Glu Gln Phe Val Ala Arg Leu Ala Arg Glu Leu Glu Glu Thr
195 200 205

Ile Gln Lys Glu Gly Ala Asp Thr Ile Ala Gly Phe Phe Ala Glu Pro
210 215 220

Val Met Gly Ala Gly Gly Val Ile Pro Pro Ala Lys Gly Tyr Phe Gln
225 230 235 240

Ala Ile Leu Pro Ile Leu Arg Lys Tyr Asp Ile Pro Val Ile Ser Asp
245 250 255

Glu Val Val Cys Gly Phe Gly Arg Thr Gly Asn Thr Trp Gly Cys Val
260 265 270

Thr Tyr Asp Phe Thr Pro Asp Ala Ile Ile Ser Ser Lys Asn Leu Thr
275 280 285

Ala Gly Phe Phe Pro Val Gly Ala Val Ile Leu Gly Pro Glu Leu Ser
290 295 300

Lys Arg Leu Glu Thr Ala Ile Glu Ala Ile Gly Glu Phe Pro His Gly
305 310 315 320

Phe Thr Ala Gly Gly His Pro Val Gly Cys Ala Ile Ala Leu Lys Ala
325 330 335

Ile Asp Val Val Met Asn Glu Gly Leu Ala Glu Asn Val Arg Arg Leu
340 345 350

Ala Pro Arg Phe Glu Glu Arg Leu Lys His Ile Ala Glu His Pro Asn
355 360 365

Ile Gly Glu Tyr Arg Gly Ile Gly Phe Met Trp Ala Leu Glu Val Val
370 375 380

Lys Asp Lys Ala Ser Lys Ala Pro Phe Asp Gly Asn Leu Ser Val Ser
385 390 395 400

CX2-126USP1_ST25

Glu Arg Ile Ala Asn Thr Cys Thr Asp Leu Gly Leu Ile Cys Arg Pro
405 410 415

Thr Gly Gln Ser Val Val Leu Ala Pro Pro Phe Ile Leu Thr Glu Ala
420 425 430

Gln Met Asp Glu Met Phe Asp Lys Leu Glu Lys Ala Leu Asp Lys Val
435 440 445

Phe Ala Glu Val Ala
450

<210> 199
<211> 1359
<212> DNA
<213> Artificial Sequence

<220>
<223> Engineered variant of V. fluvialis transaminase

<400> 199
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atcgtggatg tgcattggccg tcgttatctg gatgcgatga gcggcgcttt caacatggtg 180
gcgggctttg atcataaagg cctgattgat gcggcgaaag cgcagtatga acgttttccg 240
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gtggaagtga gcccgtttga tagcggccgt gtgttttata ccaacagcgg cagcgaagcg 360
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cgtaaaattc tgaccctgtg gaacgcgtat catggcgtga ccgtagtgag cgcgagcatg 480
accggctttc cgttcaacag cgtgtttggc cagccgctgc cgggctttct gcattctgacc 540
tgcccgcatt attggcggtt tggcgaagaa ggcgaaaccg aagaacagtt tgcgcgcgt 600
ctggcccgtg aactggaaga aaccattcag aagggaaggc cggataccat tgcgggcttt 660
tttgcggaac cgggtgatggg tgctggcggg gttattccgc cggcgaaagg ctattttcag 720
gcgattctgc cgatcctgcg caaatatgat attccgggtg tcagcgatga agtggtgtgc 780
ggctttggcc gtaccggtaa cacctggggc tgcgtgacct atgattttac cccggatgcg 840
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ccggaactga gcaaactgtc ggaaaccgcg attgaagcga tcggcgaatt tccgcatggt 960
tttaccgcgg gcggccatcc ggtgggttgt gcgattgcgc tgaaagcgat tgatgtggtg 1020
atgaacgaag gcctggccga aaacgtgcgt cgtctggccc cgcgttttga agaactctg 1080
aaacatatat cggaacatcc gaacattggc gaatatcgtg gcattggctt tatgtgggcg 1140
ctggaagtgt tgaaagataa agcgagcaaa gccccgtttg atggcaacct gagcgtgagc 1200
gaacgtattg cgaacacctg caccgatctg ggcctgattt gccgtccgac aggccagagc 1260
gtggttcttg ctccgcgggt cattctgacc gaagcgcaga tggatgaaat gttcgataaa 1320

ctggaaaaag cgctggataa agtgtttgcg gaagtggcg

1359

<210> 200
 <211> 453
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> Engineered variant of V. fluvialis transaminase

<400> 200

Met Asn Lys Pro Gln Ser Trp Glu Thr Arg Ala Glu Thr Tyr Ser Leu
 1 5 10 15

Tyr Gly Phe Thr Asp Met Pro Ser Leu His Gln Arg Gly Thr Met Val
 20 25 30

Val Ala His Gly Glu Gly Pro Tyr Ile Val Asp Val His Gly Arg Arg
 35 40 45

Tyr Leu Asp Ala Met Ser Gly Ala Phe Asn Met Val Ala Gly Phe Asp
 50 55 60

His Lys Gly Leu Ile Asp Ala Ala Lys Ala Gln Tyr Glu Arg Phe Pro
 65 70 75 80

Gly Tyr His Ala Phe Cys Gly Tyr Met Ser Asp Gln Thr Val Met Leu
 85 90 95

Ser Glu Lys Leu Val Glu Val Ser Pro Phe Asp Ser Gly Arg Val Phe
 100 105 110

Tyr Thr Asn Ser Gly Ser Glu Ala Asn Asp Thr Met Val Lys Met Leu
 115 120 125

Trp Phe Leu His Ala Ala Glu Gly Lys Pro Gln Lys Arg Lys Ile Leu
 130 135 140

Thr Leu Trp Asn Ala Tyr His Gly Val Thr Val Val Ser Ala Ser Met
 145 150 155 160

Thr Gly Phe Pro Phe Asn Ser Val Phe Gly Gln Pro Leu Pro Gly Phe
 165 170 175

Leu His Leu Thr Cys Pro His Tyr Trp Arg Tyr Gly Glu Glu Gly Glu
 180 185 190

Thr Glu Glu Gln Phe Val Ala Arg Leu Ala Arg Glu Leu Glu Glu Thr
 195 200 205

Ile Gln Lys Glu Gly Ala Asp Thr Ile Ala Gly Phe Phe Ala Glu Pro
 210 215 220

CX2-126USP1_ST25

Val Met Gly Ala Gly Gly Val Ile Pro Pro Ala Lys Gly Tyr Phe Gln
225 230 235 240

Ala Ile Leu Pro Ile Leu Arg Lys Tyr Asp Ile Pro Val Ile Ser Asp
245 250 255

Glu Val Val Cys Gly Phe Gly Arg Thr Gly Asn Thr Trp Gly Cys Val
260 265 270

Thr Tyr Asp Phe Thr Pro Asp Ala Ile Ile Ser Ser Lys Asn Leu Thr
275 280 285

Ala Gly Phe Phe Pro Val Gly Ala Val Ile Leu Gly Pro Glu Leu Ser
290 295 300

Lys Arg Leu Glu Thr Ala Ile Glu Ala Ile Gly Glu Phe Pro His Gly
305 310 315 320

Phe Thr Ala Gly Gly His Pro Val Gly Cys Ala Ile Ala Leu Lys Ala
325 330 335

Ile Asp Val Val Met Asn Glu Gly Leu Ala Glu Asn Val Arg Arg Leu
340 345 350

Ala Pro Arg Phe Glu Glu Arg Leu Lys His Ile Ala Glu His Pro Asn
355 360 365

Ile Gly Glu Tyr Arg Gly Ile Gly Phe Met Trp Ala Leu Glu Val Val
370 375 380

Lys Asp Lys Ala Ser Lys Ala Pro Phe Asp Gly Asn Leu Ser Val Ser
385 390 395 400

Glu Arg Ile Ala Asn Thr Cys Thr Asp Leu Gly Leu Ile Cys Arg Pro
405 410 415

Thr Gly Gln Ser Val Val Leu Ala Pro Arg Phe Ile Leu Thr Glu Ala
420 425 430

Gln Met Asp Glu Met Phe Asp Lys Leu Glu Lys Ala Leu Asp Lys Val
435 440 445

Phe Ala Glu Val Ala
450

<210> 201
<211> 1359
<212> DNA
<213> Artificial Sequence

<220>

<223> Engineered variant of *V. fluvialis* transaminase

<400> 201

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atcgtggatg tgcattggccg tcgttatctg gatgcgatga gcggcgcttt gaacatggtg      180
gcgggctttg atcataaagg cctgattgat gcggcgaaaag cgagatga acgttttccg      240
ggctatcatg cgttttgcgg ctatatgagc gatcagaccg tgatgctgtc tgaaaaactg      300
gtggaagtga gcccgtttga tagcggccgt gtgttttata ccaacagcgg cagcgaagcg      360
aacgatacca tgggtgaaaat gctgtggttt ctgcatgcgg cggaaggcaa accgcagaaa      420
cgtaaaattc tgaccctgtg gaacgcgtat catggctgca ccgtagtgag cgcgagcatg      480
accggctttc cgttcaacag cgtgtttggc ctgccgctgc cgggctttct gcatctgacc      540
tgcccgcatc attggcggtt tggcgaagaa ggcgaaaccg aagaacagtt tgtcgcgcgt      600
ctggcccgtg aactggaaga aaccattcag aagggaaggcg cggataccat tgcgggcttt      660
tttgcggaac cggatgatggg tgctggcggg gttattccgc cggcgaaagg ctattttcag      720
gcgattctgc cgatcctgcg caaatatgat attccggtga tcagcgatga agtgggtgtgc      780
ggctttggcc gtaccggtaa cacctggggc tgcgtgacct atgattttac cccggatgcg      840
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ccggaactga gcaaacgtct ggaaaccgcg attaatgcga tcggcggatt tccgcatggt      960
tttaccgcgg gcggccatcc ggtgggttgt gcgattgcgc tgaaagcgat tgatgtggtg     1020
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aaacatattg cggaacatcc gaacattggc gaatatcgtg gcattggctt tatgtgggcg     1140
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gaacgtattg cgaacacctg caccgatctg ggcctgattt gccgtccgac aggccagagc     1260
gtggttctgg ctccgccgtt cattctgacc gaagcgaga tggatgaaat gttcgataaa     1320
ctggaaaaag cgctggataa agtgtttgcg gaagtggcg                               1359

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<210> 202

<211> 453

<212> PRT

<213> Artificial Sequence

<220>

<223> Engineered variant of *V. fluvialis* transaminase

<400> 202

Met Asn Lys Pro Gln Ser Trp Glu Thr Arg Ala Glu Thr Tyr Ser Leu
1 5 10 15

Tyr Gly Phe Thr Asp Met Pro Ser Leu His Gln Arg Gly Thr Val Val
20 25 30

Val Ala His Gly Glu Gly Pro Tyr Ile Val Asp Val His Gly Arg Arg
 35 40 45
 Tyr Leu Asp Ala Met Ser Gly Ala Leu Asn Met Val Ala Gly Phe Asp
 50 55 60
 His Lys Gly Leu Ile Asp Ala Ala Lys Ala Gln Tyr Glu Arg Phe Pro
 65 70 75 80
 Gly Tyr His Ala Phe Cys Gly Tyr Met Ser Asp Gln Thr Val Met Leu
 85 90 95
 Ser Glu Lys Leu Val Glu Val Ser Pro Phe Asp Ser Gly Arg Val Phe
 100 105 110
 Tyr Thr Asn Ser Gly Ser Glu Ala Asn Asp Thr Met Val Lys Met Leu
 115 120 125
 Trp Phe Leu His Ala Ala Glu Gly Lys Pro Gln Lys Arg Lys Ile Leu
 130 135 140
 Thr Leu Trp Asn Ala Tyr His Gly Cys Thr Val Val Ser Ala Ser Met
 145 150 155 160
 Thr Gly Phe Pro Phe Asn Ser Val Phe Gly Leu Pro Leu Pro Gly Phe
 165 170 175
 Leu His Leu Thr Cys Pro His Tyr Trp Arg Tyr Gly Glu Glu Gly Glu
 180 185 190
 Thr Glu Glu Gln Phe Val Ala Arg Leu Ala Arg Glu Leu Glu Glu Thr
 195 200 205
 Ile Gln Lys Glu Gly Ala Asp Thr Ile Ala Gly Phe Phe Ala Glu Pro
 210 215 220
 Val Met Gly Ala Gly Gly Val Ile Pro Pro Ala Lys Gly Tyr Phe Gln
 225 230 235 240
 Ala Ile Leu Pro Ile Leu Arg Lys Tyr Asp Ile Pro Val Ile Ser Asp
 245 250 255
 Glu Val Val Cys Gly Phe Gly Arg Thr Gly Asn Thr Trp Gly Cys Val
 260 265 270
 Thr Tyr Asp Phe Thr Pro Asp Ala Ile Ile Ser Ser Lys Asn Leu Thr
 275 280 285
 Ala Gly Phe Phe Pro Val Gly Ala Val Ile Leu Gly Pro Glu Leu Ser
 290 295 300

CX2-126USP1_ST25

Lys Arg Leu Glu Thr Ala Ile Asn Ala Ile Gly Gly Phe Pro His Gly
305 310 315 320

Phe Thr Ala Gly Gly His Pro Val Gly Cys Ala Ile Ala Leu Lys Ala
325 330 335

Ile Asp Val Val Met Asn Glu Gly Leu Ala Glu Asn Val Arg Arg Leu
340 345 350

Ala Pro Arg Phe Glu Glu Arg Leu Lys His Ile Ala Glu His Pro Asn
355 360 365

Ile Gly Glu Tyr Arg Gly Ile Gly Phe Met Trp Ala Leu Glu Val Val
370 375 380

Lys Asp Lys Ala Ser Lys Ala Pro Phe Asp Gly Asn Leu Ser Val Ser
385 390 395 400

Glu Arg Ile Ala Asn Thr Cys Thr Asp Leu Gly Leu Ile Cys Arg Pro
405 410 415

Thr Gly Gln Ser Val Val Leu Ala Pro Pro Phe Ile Leu Thr Glu Ala
420 425 430

Gln Met Asp Glu Met Phe Asp Lys Leu Glu Lys Ala Leu Asp Lys Val
435 440 445

Phe Ala Glu Val Ala
450

<210> 203
<211> 1359
<212> DNA
<213> Artificial sequence

<220>
<223> Engineered variant of v. fluvialis transaminase

<400> 203
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CX2-126USP1_ST25

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<210> 204

<211> 453

<212> PRT

<213> Artificial Sequence

<220>

<223> Engineered variant of V. fluvialis transaminase

<400> 204

Met Asn Lys Pro Gln Ser Trp Glu Thr Arg Ala Glu Thr Tyr Ser Leu
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Tyr Gly Phe Thr Asp Met Pro Ser Leu His Gln Arg Gly Thr Met Val
 20 25 30

Val Ala His Gly Glu Gly Pro Tyr Ile Val Asp Val His Gly Arg Arg
 35 40 45

Tyr Leu Asp Ala Met Ser Gly Ala Phe Asn Met Val Ala Gly Phe Asp
 50 55 60

His Lys Gly Leu Ile Asp Ala Ala Lys Ala Gln Tyr Glu Arg Phe Pro
 65 70 75 80

Gly Tyr His Ala Phe Cys Gly Tyr Met Ser Asp Gln Thr Val Met Leu
 85 90 95

Ser Glu Lys Leu Val Glu Val Ser Pro Phe Asp Ser Gly Arg Val Phe
 100 105 110

Tyr Thr Asn Ser Gly Ser Glu Ala Asn Asp Thr Met Val Lys Met Leu
 115 120 125

CX2-126USP1_ST25

Trp Phe Leu His Ala Ala Glu Gly Lys Pro Gln Lys Arg Lys Ile Leu
 130 135 140
 Thr Leu Trp Asn Ala Tyr His Gly Cys Thr Val Val Ser Ala Ser Met
 145 150 155 160
 Thr Gly Phe Pro Phe Asn Ser Val Phe Gly Leu Pro Leu Pro Gly Phe
 165 170 175
 Leu His Leu Thr Cys Pro His Tyr Trp Arg Tyr Gly Glu Glu Gly Glu
 180 185 190
 Thr Glu Glu Gln Phe Val Ala Arg Leu Ala Arg Glu Leu Glu Glu Thr
 195 200 205
 Ile Gln Lys Glu Gly Ala Asp Thr Ile Ala Gly Phe Phe Ala Glu Pro
 210 215 220
 Val Met Gly Ala Gly Gly Val Ile Pro Pro Ala Lys Gly Tyr Phe Gln
 225 230 235 240
 Ala Ile Leu Pro Ile Leu Arg Lys Tyr Asp Ile Pro Val Ile Ser Asp
 245 250 255
 Glu Val Val Cys Gly Phe Gly Arg Thr Gly Asn Thr Trp Gly Cys Val
 260 265 270
 Thr Tyr Asp Phe Thr Pro Asp Ala Ile Ile Ser Ser Lys Asn Leu Thr
 275 280 285
 Ala Gly Phe Phe Pro Val Gly Ala Val Ile Leu Gly Pro Glu Leu Ser
 290 295 300
 Lys Arg Leu Glu Thr Ala Ile Asn Ala Ile Gly Glu Phe Pro His Gly
 305 310 315 320
 Phe Thr Ala Gly Gly His Pro Val Gly Cys Ala Ile Ala Leu Lys Ala
 325 330 335
 Ile Asp Val Val Met Asn Glu Gly Leu Ala Glu Asn Val Arg Arg Leu
 340 345 350
 Ala Pro Arg Phe Glu Glu Arg Leu Lys His Ile Ala Glu His Pro Asn
 355 360 365
 Ile Gly Glu Tyr Arg Gly Ile Gly Phe Met Trp Ala Leu Glu Val Val
 370 375 380
 Lys Asp Lys Ala Ser Lys Ala Pro Phe Asp Gly Asn Leu Ser Val Ser
 385 390 395 400

CX2-126USP1_ST25

Glu Arg Ile Ala Asn Thr Cys Thr Asp Leu Gly Leu Ile Cys Arg Pro
 405 410 415

Thr Gly Gln Ser Val Val Leu Ala Pro Pro Phe Ile Leu Thr Glu Ala
 420 425 430

Gln Met Asp Glu Met Phe Asp Lys Leu Glu Lys Ala Leu Asp Lys Val
 435 440 445

Phe Ala Glu Val Ala
 450