

SEQUENCE LISTING

<110> F. Hoffmann-La Roche AG
Roche Diagnostics GmbH

<120> DNA Polymerases With Improved Activity

<130> 27043 WO-HS

<140> Not yet assigned

<141> Not yet assigned

<150> US 61/512,488

<151> 2011-07-28

<160> 40

<170> FastSEQ for Windows Version 4.0

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<211> 834

<212> PRT

<213> Thermus sp.

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<223> Thermus sp. Z05 DNA polymerase (Z05)

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Leu Thr Thr Ser Arg Gly Glu Pro Val Gln Ala Val Tyr Gly Phe Ala
 35      40      45
Lys Ser Leu Leu Lys Ala Leu Lys Glu Asp Gly Tyr Lys Ala Val Phe
 50      55      60
Val Val Phe Asp Ala Lys Ala Pro Ser Phe Arg His Glu Ala Tyr Glu
 65      70      75      80
Ala Tyr Lys Ala Gly Arg Ala Pro Thr Pro Glu Asp Phe Pro Arg Gln
 85      90      95
Leu Ala Leu Ile Lys Glu Leu Val Asp Leu Leu Gly Phe Thr Arg Leu
 100     105     110
Glu Val Pro Gly Phe Glu Ala Asp Val Leu Ala Thr Leu Ala Lys
 115     120     125
Lys Ala Glu Arg Glu Gly Tyr Glu Val Arg Ile Leu Thr Ala Asp Arg
 130     135     140
Asp Leu Tyr Gln Leu Val Ser Asp Arg Val Ala Val Leu His Pro Glu
 145     150     155     160
Gly His Leu Ile Thr Pro Glu Trp Leu Trp Glu Lys Tyr Gly Leu Lys
 165     170     175
Pro Glu Gln Trp Val Asp Phe Arg Ala Leu Val Gly Asp Pro Ser Asp
 180     185     190
Asn Leu Pro Gly Val Lys Gly Ile Gly Glu Lys Thr Ala Leu Lys Leu
 195     200     205
Leu Lys Glu Trp Gly Ser Leu Glu Asn Ile Leu Lys Asn Leu Asp Arg
 210     215     220
Val Lys Pro Glu Ser Val Arg Glu Arg Ile Lys Ala His Leu Glu Asp
 225     230     235     240
Leu Lys Leu Ser Leu Glu Leu Ser Arg Val Arg Ser Asp Leu Pro Leu
 245     250     255
Glu Val Asp Phe Ala Arg Arg Arg Glu Pro Asp Arg Glu Gly Leu Arg
 260     265     270
Ala Phe Leu Glu Arg Leu Glu Phe Gly Ser Leu Leu His Glu Phe Gly
 275     280     285
Leu Leu Glu Ala Pro Ala Pro Leu Glu Glu Ala Pro Trp Pro Pro Pro
 290     295     300

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Glu	Gly	Ala	Phe	Val	Gly	Phe	Val	Leu	Ser	Arg	Pro	Glu	Pro	Met	Trp
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Ala	Glu	Leu	Lys	Ala	Leu	Ala	Ala	Cys	Lys	Glu	Gly	Arg	Val	His	Arg
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Ala	Lys	Asp	Pro	Leu	Ala	Gly	Leu	Lys	Asp	Leu	Lys	Glu	Val	Arg	Gly
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Leu	Ala	Pro	Ser	Asp	Asp	Pro	Met	Leu	Leu	Ala	Tyr	Leu	Leu	Asp	Pro
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Ser	Asn	Thr	Thr	Pro	Glu	Gly	Val	Ala	Arg	Arg	Tyr	Gly	Gly	Glu	Trp
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Thr	Glu	Asp	Ala	Ala	His	Arg	Ala	Leu	Leu	Ala	Glu	Arg	Leu	Gln	Gln
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Asn	Leu	Leu	Glu	Arg	Leu	Lys	Gly	Glu	Glu	Lys	Leu	Leu	Trp	Leu	Tyr
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Gln	Glu	Val	Glu	Lys	Pro	Leu	Ser	Arg	Val	Leu	Ala	His	Met	Glu	Ala
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Thr	Gly	Val	Arg	Leu	Asp	Val	Ala	Tyr	Leu	Lys	Ala	Leu	Ser	Leu	Glu
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Leu	Ala	Glu	Glu	Ile	Arg	Arg	Leu	Glu	Glu	Glu	Val	Phe	Arg	Leu	Ala
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Gly	His	Pro	Phe	Asn	Leu	Asn	Ser	Arg	Asp	Gln	Leu	Glu	Arg	Val	Leu
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Phe	Asp	Glu	Leu	Arg	Leu	Pro	Ala	Leu	Gly	Lys	Thr	Gln	Lys	Thr	Gly
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Arg	Leu	His	Thr	Arg	Phe	Asn	Gln	Thr	Ala	Thr	Ala	Thr	Gly	Arg	Leu
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Ser	Ser	Ser	Asp	Pro	Asn	Leu	Gln	Asn	Ile	Pro	Ile	Arg	Thr	Pro	Leu
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Gly	Gln	Arg	Ile	Arg	Arg	Ala	Phe	Val	Ala	Glu	Ala	Gly	Trp	Ala	Leu
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Val	Ala	Leu	Asp	Tyr	Ser	Gln	Ile	Glu	Leu	Arg	Val	Leu	Ala	His	Leu
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Ser	Gly	Asp	Glu	Asn	Leu	Ile	Arg	Val	Phe	Gln	Glu	Gly	Lys	Asp	Ile
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His	Thr	Gln	Thr	Ala	Ser	Trp	Met	Phe	Gly	Val	Ser	Pro	Glu	Ala	Val
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Tyr	Gly	Met	Ser	Ala	His	Arg	Leu	Ser	Gln	Glu	Leu	Ala	Ile	Pro	Tyr
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Tyr	Val	Glu	Thr	Leu	Phe	Gly	Arg	Arg	Arg	Tyr	Val	Pro	Asp	Leu	Asn
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Ala	Arg	Val	Lys	Ser	Val	Arg	Glu	Ala	Ala	Glu	Arg	Met	Ala	Phe	Asn
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Val	Ala	Ala	Leu	Ala	Lys	Glu	Ala	Met	Glu	Lys	Ala	Tyr	Pro	Leu	Ala
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<212> PRT
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<220>
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Lys Ser Leu Leu Lys Ala Leu Lys Glu Asp Gly Asp Ala Val Ile Val
50 55 60
Val Phe Asp Ala Lys Ala Pro Ser Phe Arg His Glu Ala Tyr Gly Gly
65 70 75 80
Tyr Lys Ala Gly Arg Ala Pro Thr Pro Glu Asp Phe Pro Arg Gln Leu
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Ala Leu Ile Lys Glu Leu Val Asp Leu Leu Gly Leu Ala Arg Leu Glu
100 105 110
Val Pro Gly Tyr Glu Ala Asp Asp Val Leu Ala Ser Leu Ala Lys Lys
115 120 125
Ala Glu Lys Glu Gly Tyr Glu Val Arg Ile Leu Thr Ala Asp Lys Asp
130 135 140
Leu Tyr Gln Leu Leu Ser Asp Arg Ile His Val Leu His Pro Glu Gly
145 150 155 160
Tyr Leu Ile Thr Pro Ala Trp Leu Trp Glu Lys Tyr Gly Leu Arg Pro
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Asp Gln Trp Ala Asp Tyr Arg Ala Leu Thr Gly Asp Glu Ser Asp Asn
180 185 190
Leu Pro Gly Val Lys Gly Ile Gly Glu Lys Thr Ala Arg Lys Leu Leu
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Glu Glu Trp Gly Ser Leu Glu Ala Leu Leu Lys Asn Leu Asp Arg Leu
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Lys Pro Ala Ile Arg Glu Lys Ile Leu Ala His Met Asp Asp Leu Lys
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Leu Ser Trp Asp Leu Ala Lys Val Arg Thr Asp Leu Pro Leu Glu Val
245 250 255
Asp Phe Ala Lys Arg Arg Glu Pro Asp Arg Glu Arg Leu Arg Ala Phe
260 265 270

Leu Glu Arg Leu Glu Phe Gly Ser Leu Leu His Glu Phe Gly Leu Leu
275 280 285
Glu Ser Pro Lys Ala Leu Glu Glu Ala Pro Trp Pro Pro Glu Gly
290 295 300
Ala Phe Val Gly Phe Val Leu Ser Arg Lys Glu Pro Met Trp Ala Asp
305 310 315 320
Leu Leu Ala Leu Ala Ala Arg Gly Gly Arg Val His Arg Ala Pro
325 330 335
Glu Pro Tyr Lys Ala Leu Arg Asp Leu Lys Glu Ala Arg Gly Leu Leu
340 345 350
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Pro Gly Asp Asp Pro Met Leu Leu Ala Tyr Leu Leu Asp Pro Ser Asn
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Thr Thr Pro Glu Gly Val Ala Arg Arg Tyr Gly Gly Glu Trp Thr Glu
385 390 395 400
Glu Ala Gly Glu Arg Ala Ala Leu Ser Glu Arg Leu Phe Ala Asn Leu
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Trp Gly Arg Leu Glu Gly Glu Glu Arg Leu Leu Trp Leu Tyr Arg Glu
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Glu	Glu	Ile	Ala	Arg	Leu	Glu	Ala	Glu	Val	Phe	Arg	Leu	Ala	Gly	His
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Pro	Phe	Asn	Leu	Asn	Ser	Arg	Asp	Gln	Leu	Glu	Arg	Val	Leu	Phe	Asp
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Glu	Leu	Gly	Leu	Pro	Ala	Ile	Gly	Lys	Thr	Glu	Lys	Thr	Gly	Lys	Arg
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Ser	Thr	Ser	Ala	Ala	Val	Leu	Glu	Ala	Leu	Arg	Glu	Ala	His	Pro	Ile
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Val	Glu	Lys	Ile	Leu	Gln	Tyr	Arg	Glu	Leu	Thr	Lys	Leu	Lys	Ser	Thr
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Tyr	Ile	Asp	Pro	Leu	Pro	Asp	Leu	Ile	His	Pro	Arg	Thr	Gly	Arg	Leu
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His	Thr	Arg	Phe	Asn	Gln	Thr	Ala	Thr	Ala	Thr	Gly	Arg	Leu	Ser	Ser
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Ser	Asp	Pro	Asn	Leu	Gln	Asn	Ile	Pro	Val	Arg	Thr	Pro	Leu	Gly	Gln
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Arg	Ile	Arg	Arg	Ala	Phe	Ile	Ala	Glu	Glu	Gly	Trp	Leu	Leu	Val	Ala
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Asp	Glu	Asn	Leu	Ile	Arg	Val	Phe	Gln	Glu	Gly	Arg	Asp	Ile	His	Thr
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Glu	Thr	Ala	Ser	Trp	Met	Phe	Gly	Val	Pro	Arg	Glu	Ala	Val	Asp	Pro
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Ala	Gln	Ala	Phe	Ile	Glu	Arg	Tyr	Phe	Gln	Ser	Phe	Pro	Lys	Val	Arg
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Ala	Trp	Ile	Glu	Lys	Thr	Leu	Glu	Glu	Gly	Arg	Arg	Arg	Gly	Tyr	Val
705					710					715					720
Glu	Thr	Leu	Phe	Gly	Arg	Arg	Arg	Tyr	Val	Pro	Asp	Leu	Glu	Ala	Arg
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Val	Lys	Ser	Val	Arg	Glu	Ala	Ala	Glu	Arg	Met	Ala	Phe	Asn	Met	Pro
			740					745					750		
Val	Gln	Gly	Thr	Ala	Ala	Asp	Leu	Met	Lys	Leu	Ala	Met	Val	Lys	Leu
		755					760					765			
Phe	Pro	Arg	Leu	Glu	Glu	Met	Gly	Ala	Arg	Met	Leu	Leu	Gln	Val	His
	770					775					780				
Asp	Glu	Leu	Val	Leu	Glu	Ala	Pro	Lys	Glu	Arg	Ala	Glu	Ala	Val	Ala
785					790					795					800
Arg	Leu	Ala	Lys	Glu	Val	Met	Glu	Gly	Val	Tyr	Pro	Leu	Ala	Val	Pro
				805					810					815	
Leu	Glu	Val	Glu	Val	Gly	Ile	Gly	Glu	Asp	Trp	Leu	Ser	Ala	Lys	Glu
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<220>
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Pro Asn Leu Gln Asn Ile Pro Val Arg Thr Pro Leu Gly Gln Arg Ile
 580 585 590
 Arg Lys Ala Phe Ile Ala Glu Glu Gly His Leu Leu Val Ala Leu Asp
 595 600 605
 Tyr Ser Gln Ile Glu Leu Arg Val Leu Ala His Leu Ser Gly Asp Glu
 610 615 620
 Asn Leu Ile Arg Val Phe Arg Glu Gly Lys Asp Ile His Thr Glu Thr
 625 630 635 640
 Ala Ala Trp Met Phe Gly Val Pro Pro Glu Gly Val Asp Gly Ala Met
 645 650 655
 Arg Arg Ala Ala Lys Thr Val Asn Phe Gly Val Leu Tyr Gly Met Ser
 660 665 670
 Ala His Arg Leu Ser Gln Glu Leu Ser Ile Pro Tyr Glu Glu Ala Ala
 675 680 685
 Ala Phe Ile Glu Arg Tyr Phe Gln Ser Phe Pro Lys Val Arg Ala Trp
 690 695 700
 Ile Ala Lys Thr Leu Glu Glu Gly Arg Lys Lys Gly Tyr Val Glu Thr
 705 710 715 720
 Leu Phe Gly Arg Arg Arg Tyr Val Pro Asp Leu Asn Ala Arg Val Lys
 725 730 735
 Ser Val Arg Glu Ala Ala Glu Arg Met Ala Phe Asn Met Pro Val Gln
 740 745 750
 Gly Thr Ala Ala Asp Leu Met Lys Leu Ala Met Val Lys Leu Phe Pro
 755 760 765
 Arg Leu Arg Pro Leu Gly Val Arg Ile Leu Leu Gln Val His Asp Glu
 770 775 780
 Leu Val Leu Glu Ala Pro Lys Ala Arg Ala Glu Ala Ala Gln Leu
 785 790 795 800
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 820 825 830

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 <213> Thermus flavus

<220>
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 35 40 45
 Ser Leu Leu Lys Ala Leu Lys Glu Asp Gly Asp Val Val Val Val Val
 50 55 60
 Phe Asp Ala Lys Ala Pro Ser Phe Arg His Glu Ala Tyr Glu Ala Tyr
 65 70 75 80
 Lys Ala Gly Arg Ala Pro Thr Pro Glu Asp Phe Pro Arg Gln Leu Ala
 85 90 95
 Leu Ile Lys Glu Leu Val Asp Leu Leu Gly Leu Val Arg Leu Glu Val
 100 105 110
 Pro Gly Phe Glu Ala Asp Asp Val Leu Ala Thr Leu Ala Lys Arg Ala
 115 120 125
 Glu Lys Glu Gly Tyr Glu Val Arg Ile Leu Thr Ala Asp Arg Asp Leu
 130 135 140
 Tyr Gln Leu Leu Ser Glu Arg Ile Ala Ile Leu His Pro Glu Gly Tyr
 145 150 155 160
 Leu Ile Thr Pro Ala Trp Leu Tyr Glu Lys Tyr Gly Leu Arg Pro Glu
 165 170 175
 Gln Trp Val Asp Tyr Arg Ala Leu Ala Gly Asp Pro Ser Asp Asn Ile

Thr	Leu	Phe	Gly	Arg	Arg	Arg	Tyr	Val	Pro	Asp	Leu	Asn	Ala	Arg	Val
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Lys	Ser	Val	Arg	Glu	Ala	Ala	Glu	Arg	Met	Ala	Phe	Asn	Met	Pro	Val
			740					745					750		
Gln	Gly	Thr	Ala	Ala	Asp	Leu	Met	Lys	Leu	Ala	Met	Val	Arg	Leu	Phe
		755					760					765			
Pro	Arg	Leu	Gln	Glu	Leu	Gly	Ala	Arg	Met	Leu	Leu	Gln	Val	His	Asp
	770					775					780				
Glu	Leu	Val	Leu	Glu	Ala	Pro	Lys	Asp	Arg	Ala	Glu	Arg	Val	Ala	Ala
785					790					795					800
Leu	Ala	Lys	Glu	Val	Met	Glu	Gly	Val	Trp	Pro	Leu	Gln	Val	Pro	Leu
				805					810					815	
Glu	Val	Glu	Val	Gly	Leu	Gly	Glu	Asp	Trp	Leu	Ser	Ala	Lys	Glu	
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<211> 830

<212> PRT

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<220>

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			20					25					30		
Ser	Arg	Gly	Glu	Pro	Val	Gln	Ala	Val	Tyr	Gly	Phe	Ala	Lys	Ser	Leu
		35					40					45			
Leu	Lys	Ala	Leu	Lys	Glu	Asp	Gly	Glu	Val	Ala	Ile	Val	Val	Phe	Asp
	50					55					60				
Ala	Lys	Ala	Pro	Ser	Phe	Arg	His	Glu	Ala	Tyr	Glu	Ala	Tyr	Lys	Ala
65					70					75					80
Gly	Arg	Ala	Pro	Thr	Pro	Glu	Asp	Phe	Pro	Arg	Gln	Leu	Ala	Leu	Ile
				85					90					95	
Lys	Glu	Leu	Val	Asp	Leu	Leu	Gly	Leu	Val	Arg	Leu	Glu	Val	Pro	Gly
			100					105					110		
Phe	Glu	Ala	Asp	Asp	Val	Leu	Ala	Thr	Leu	Ala	Lys	Lys	Ala	Glu	Arg
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Glu	Gly	Tyr	Glu	Val	Arg	Ile	Leu	Ser	Ala	Asp	Arg	Asp	Leu	Tyr	Gln
	130					135					140				
Leu	Leu	Ser	Asp	Arg	Ile	His	Leu	Leu	His	Pro	Glu	Gly	Glu	Val	Leu
145					150					155					160
Thr	Pro	Gly	Trp	Leu	Gln	Glu	Arg	Tyr	Gly	Leu	Ser	Pro	Glu	Arg	Trp
				165					170					175	
Val	Glu	Tyr	Arg	Ala	Leu	Val	Gly	Asp	Pro	Ser	Asp	Asn	Leu	Pro	Gly
			180					185					190		
Val	Pro	Gly	Ile	Gly	Glu	Lys	Thr	Ala	Leu	Lys	Leu	Leu	Lys	Glu	Trp
		195					200					205			
Gly	Ser	Leu	Glu	Ala	Ile	Leu	Lys	Asn	Leu	Asp	Gln	Val	Lys	Pro	Glu
	210					215					220				
Arg	Val	Arg	Glu	Ala	Ile	Arg	Asn	Asn	Leu	Asp	Lys	Leu	Gln	Met	Ser
225					230					235					240
Leu	Glu	Leu	Ser	Arg	Leu	Arg	Thr	Asp	Leu	Pro	Leu	Glu	Val	Asp	Phe
				245					250					255	
Ala	Lys	Arg	Arg	Glu	Pro	Asp	Trp	Glu	Gly	Leu	Lys	Ala	Phe	Leu	Glu
			260					265					270		
Arg	Leu	Glu	Phe	Gly	Ser	Leu	Leu	His	Glu	Phe	Gly	Leu	Leu	Glu	Ala
		275					280					285			
Pro	Lys	Glu	Ala	Glu	Glu	Ala	Pro	Trp	Pro	Pro	Pro	Gly	Gly	Ala	Phe
	290					295					300				
Leu	Gly	Phe	Leu	Leu	Ser	Arg	Pro	Glu	Pro	Met	Trp	Ala	Glu	Leu	Leu
305					310					315					320
Ala	Leu	Ala	Gly	Ala	Lys	Glu	Gly	Arg	Val	His	Arg	Ala	Glu	Asp	Pro

Val	Gly	Ala	Leu	325	Lys	Asp	Leu	Lys	Glu	330	Ile	Arg	Gly	Leu	Leu	335	Ala	Lys
Asp	Leu	Ser	Val	340	Leu	Ala	Leu	Arg	Glu	345	Gly	Arg	Glu	Ile	Pro	350	Pro	Gly
Asp	Asp	Pro	Met	355	Leu	Leu	Ala	Tyr	Leu	360	Leu	Asp	Pro	Gly	Asn	365	Thr	Asn
Pro	Glu	Gly	Val	370	Ala	Arg	Arg	Tyr	Gly	375	Gly	Glu	Trp	Lys	Glu	380	Asp	Ala
Ala	Ala	Arg	Ala	385	Leu	Leu	Ser	Glu	Arg	390	Leu	Trp	Gln	Ala	Leu	395	Tyr	Pro
Arg	Val	Ala	Glu	405	Glu	Glu	Arg	Leu	Leu	410	Trp	Leu	Tyr	Arg	Glu	415	Val	Glu
Arg	Pro	Leu	Ala	420	Gln	Val	Leu	Ala	His	425	Met	Glu	Ala	Thr	Gly	430	Val	Arg
Leu	Asp	Val	Pro	435	Tyr	Leu	Glu	Ala	Leu	440	Ser	Gln	Glu	Val	Ala	445	Phe	Glu
Leu	Glu	Arg	Leu	450	Glu	Ala	Glu	Val	His	455	Arg	Leu	Ala	Gly	His	460	Pro	Phe
Asn	Leu	Asn	Ser	465	Arg	Asp	Gln	Leu	Glu	470	Arg	Val	Leu	Phe	Asp	475	Glu	Leu
Gly	Leu	Pro	Pro	485	Ile	Gly	Lys	Thr	Glu	490	Lys	Thr	Gly	Lys	Arg	495	Ser	Thr
Ser	Ala	Ala	Val	500	Leu	Glu	Leu	Leu	Arg	505	Glu	Ala	His	Pro	Ile	510	Val	Gly
Arg	Ile	Leu	Glu	515	Tyr	Arg	Glu	Leu	Met	520	Lys	Leu	Lys	Ser	Thr	525	Tyr	Ile
Asp	Pro	Leu	Pro	530	Arg	Leu	Val	His	Pro	535	Lys	Thr	Gly	Arg	Leu	540	His	Thr
Arg	Phe	Asn	Gln	545	Thr	Ala	Thr	Ala	Thr	550	Gly	Arg	Leu	Ser	Ser	555	Ser	Asp
Pro	Asn	Leu	Gln	565	Asn	Ile	Pro	Val	Arg	570	Thr	Pro	Leu	Gly	Gln	575	Arg	Ile
Arg	Lys	Ala	Phe	580	Ile	Ala	Glu	Glu	Gly	585	His	Leu	Leu	Val	Ala	590	Leu	Asp
Tyr	Ser	Gln	Ile	595	Glu	Leu	Arg	Val	Leu	600	Ala	His	Leu	Ser	Gly	605	Asp	Glu
Asn	Leu	Ile	Arg	610	Val	Phe	Arg	Glu	Gly	615	Lys	Asp	Ile	His	Thr	620	Glu	Thr
Ala	Ala	Trp	Met	625	Phe	Gly	Val	Pro	Pro	630	Glu	Gly	Val	Asp	Gly	635	Ala	Met
Arg	Arg	Ala	Ala	645	Lys	Thr	Val	Asn	Phe	650	Gly	Val	Leu	Tyr	Gly	655	Met	Ser
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Ile	Ala	Lys	Thr	690	Leu	Glu	Glu	Gly	Arg	695	Lys	Lys	Gly	Tyr	Val	700	Glu	Thr
Leu	Phe	Gly	Arg	705	Arg	Arg	Tyr	Val	Pro	710	Asp	Leu	Asn	Ala	Arg	715	Val	Lys
Ser	Val	Arg	Glu	725	Ala	Ala	Glu	Arg	Met	730	Ala	Phe	Asn	Met	Pro	735	Val	Gln
Gly	Thr	Ala	Ala	740	Asp	Leu	Met	Lys	Leu	745	Ala	Met	Val	Lys	Leu	750	Phe	Pro
Arg	Leu	Arg	Pro	755	Leu	Gly	Val	Arg	Ile	760	Leu	Leu	Gln	Val	His	765	Asp	Glu
Leu	Val	Leu	Glu	770	Ala	Pro	Lys	Ala	Arg	775	Ala	Glu	Glu	Ala	Ala	780	Gln	Leu
Ala	Lys	Glu	Thr	785	Met	Glu	Gly	Val	Tyr	790	Pro	Leu	Ser	Val	Pro	795	Leu	Glu
Val	Glu	Val	Gly	805	Met	Gly	Glu	Asp	Trp	810	Leu	Ser	Ala	Lys	Ala	815		
			820						825						830			

<210> 6
<211> 834

<212> PRT

<213> Thermus thermophilus

<220>

<223> Thermus thermophilus DNA polymerase (Tth)

<400> 6

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			20					25					30		
Leu	Thr	Thr	Ser	Arg	Gly	Glu	Pro	Val	Gln	Ala	Val	Tyr	Gly	Phe	Ala
			35				40					45			
Lys	Ser	Leu	Leu	Lys	Ala	Leu	Lys	Glu	Asp	Gly	Tyr	Lys	Ala	Val	Phe
	50					55					60				
Val	Val	Phe	Asp	Ala	Lys	Ala	Pro	Ser	Phe	Arg	His	Glu	Ala	Tyr	Glu
65					70					75					80
Ala	Tyr	Lys	Ala	Gly	Arg	Ala	Pro	Thr	Pro	Glu	Asp	Phe	Pro	Arg	Gln
				85					90					95	
Leu	Ala	Leu	Ile	Lys	Glu	Leu	Val	Asp	Leu	Leu	Gly	Phe	Thr	Arg	Leu
			100					105					110		
Glu	Val	Pro	Gly	Tyr	Glu	Ala	Asp	Val	Leu	Ala	Thr	Leu	Ala	Lys	
		115					120					125			
Lys	Ala	Glu	Lys	Glu	Gly	Tyr	Glu	Val	Arg	Ile	Leu	Thr	Ala	Asp	Arg
	130					135					140				
Asp	Leu	Tyr	Gln	Leu	Val	Ser	Asp	Arg	Val	Ala	Val	Leu	His	Pro	Glu
145					150					155					160
Gly	His	Leu	Ile	Thr	Pro	Glu	Trp	Leu	Trp	Glu	Lys	Tyr	Gly	Leu	Arg
				165					170					175	
Pro	Glu	Gln	Trp	Val	Asp	Phe	Arg	Ala	Leu	Val	Gly	Asp	Pro	Ser	Asp
			180					185					190		
Asn	Leu	Pro	Gly	Val	Lys	Gly	Ile	Gly	Glu	Lys	Thr	Ala	Leu	Lys	Leu
		195					200					205			
Leu	Lys	Glu	Trp	Gly	Ser	Leu	Glu	Asn	Leu	Leu	Lys	Asn	Leu	Asp	Arg
	210					215					220				
Val	Lys	Pro	Glu	Asn	Val	Arg	Glu	Lys	Ile	Lys	Ala	His	Leu	Glu	Asp
225					230					235					240
Leu	Arg	Leu	Ser	Leu	Glu	Leu	Ser	Arg	Val	Arg	Thr	Asp	Leu	Pro	Leu
				245					250					255	
Glu	Val	Asp	Leu	Ala	Gln	Gly	Arg	Glu	Pro	Asp	Arg	Glu	Gly	Leu	Arg
			260					265					270		
Ala	Phe	Leu	Glu	Arg	Leu	Glu	Phe	Gly	Ser	Leu	Leu	His	Glu	Phe	Gly
		275					280					285			
Leu	Leu	Glu	Ala	Pro	Ala	Pro	Leu	Glu	Glu	Ala	Pro	Trp	Pro	Pro	Pro
	290					295					300				
Glu	Gly	Ala	Phe	Val	Gly	Phe	Val	Leu	Ser	Arg	Pro	Glu	Pro	Met	Trp
305					310					315					320
Ala	Glu	Leu	Lys	Ala	Leu	Ala	Ala	Cys	Arg	Asp	Gly	Arg	Val	His	Arg
				325					330					335	
Ala	Ala	Asp	Pro	Leu	Ala	Gly	Leu	Lys	Asp	Leu	Lys	Glu	Val	Arg	Gly
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Leu	Leu	Ala	Lys	Asp	Leu	Ala	Val	Leu	Ala	Ser	Arg	Glu	Gly	Leu	Asp
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Leu	Val	Pro	Gly	Asp	Asp	Pro	Met	Leu	Leu	Ala	Tyr	Leu	Leu	Asp	Pro
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Ser	Asn	Thr	Thr	Pro	Glu	Gly	Val	Ala	Arg	Arg	Tyr	Gly	Gly	Glu	Trp
385					390					395					400
Thr	Glu	Asp	Ala	Ala	His	Arg	Ala	Leu	Leu	Ser	Glu	Arg	Leu	His	Arg
				405					410					415	
Asn	Leu	Leu	Lys	Arg	Leu	Glu	Gly	Glu	Glu	Lys	Leu	Leu	Trp	Leu	Tyr
			420					425					430		
His	Glu	Val	Glu	Lys	Pro	Leu	Ser	Arg	Val	Leu	Ala	His	Met	Glu	Ala
		435					440					445			
Thr	Gly	Val	Arg	Arg	Asp	Val	Ala	Tyr	Leu	Gln	Ala	Leu	Ser	Leu	Glu
	450					455					460				
Leu	Ala	Glu	Glu	Ile	Arg	Arg	Leu	Glu	Glu	Glu	Val	Phe	Arg	Leu	Ala
465					470					475					480
Gly	His	Pro	Phe	Asn	Leu	Asn	Ser	Arg	Asp	Gln	Leu	Glu	Arg	Val	Leu

Phe	Asp	Glu	Leu	485 Arg	Leu	Pro	Ala	Leu	490 Gly	Lys	Thr	Gln	Lys	495 Thr	Gly
Lys	Arg	Ser	Thr	500	Ser	Ala	Ala	Val	505 Leu	Glu	Ala	Leu	Arg	510 Glu	His
Pro	Ile	Val	Glu	515	Lys	Ile	Leu	Gln	520 His	Arg	Glu	Leu	Thr	525 Lys	Lys
Asn	Thr	Tyr	Val	530	Asp	Pro	Leu	Pro	535 Ser	Leu	Val	His	Pro	540 Arg	Gly
545	Arg	Leu	His	Thr	550	Arg	Phe	Asn	Gln	Thr	Ala	Thr	Ala	Thr	560 Gly
565	Ser	Ser	Ser	Asp	570	Pro	Asn	Leu	Gln	Asn	Ile	Pro	Val	Arg	575 Thr
580	Gly	Gln	Arg	Ile	585	Arg	Arg	Ala	Phe	Val	Ala	Glu	Ala	Gly	590 Trp
595	Val	Ala	Leu	Asp	600	Tyr	Ser	Gln	Ile	Glu	Leu	Arg	Val	Leu	605 Ala
610	Ser	Gly	Asp	Glu	615	Asn	Leu	Ile	Arg	Val	Phe	Gln	Glu	Gly	620 Lys
625	His	Thr	Gln	Thr	630	Ala	Ser	Trp	Met	Phe	Gly	Val	Pro	Pro	635 Glu
640	Asp	Pro	Leu	Met	645	Arg	Arg	Ala	Ala	Lys	Thr	Val	Asn	Phe	650 Gly
655	Tyr	Gly	Met	Ser	660	Ala	His	Arg	Leu	Ser	Gln	Glu	Leu	Ala	665 Ile
670	Glu	Glu	Ala	Val	675	Ala	Phe	Ile	Glu	Arg	Tyr	Phe	Gln	Ser	680 Phe
685	Val	Arg	Ala	Trp	690	Ile	Glu	Lys	Thr	Leu	Glu	Glu	Gly	Arg	695 Lys
700	Tyr	Val	Glu	Thr	705	Leu	Phe	Gly	Arg	Arg	Arg	Tyr	Val	Pro	710 Asp
715	Ala	Arg	Val	Lys	720	Ser	Val	Arg	Glu	Ala	Ala	Glu	Arg	Met	725 Ala
730	Met	Pro	Val	Gln	735	Gly	Thr	Ala	Ala	Asp	Leu	Met	Lys	Leu	740 Ala
745	Lys	Leu	Phe	Pro	750	Arg	Leu	Arg	Glu	Met	Gly	Ala	Arg	Met	755 Leu
760	Val	His	Asp	Glu	765	Leu	Leu	Glu	Ala	Pro	Gln	Ala	Arg	Ala	770 Glu
775	Val	Ala	Ala	Leu	780	Ala	Lys	Glu	Ala	Met	Glu	Lys	Ala	Tyr	785 Pro
790	Val	Pro	Leu	Glu	795	Val	Glu	Val	Gly	Met	Gly	Glu	Asp	Trp	800 Leu
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820	Lys	Gly			825										830 Ala

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<213> Thermus caldophilus

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<400> 7

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Val Asp Gly His His Leu Ala Tyr Arg Thr Phe Phe Ala Leu Lys Gly

20 25 30

Leu Thr Thr Ser Arg Gly Glu Pro Val Gln Ala Val Tyr Gly Phe Ala

35 40 45

Lys Ser Leu Leu Lys Ala Leu Lys Glu Asp Gly Tyr Lys Ala Val Phe

50 55 60

Val Val Phe Asp Ala Lys Ala Pro Ser Phe Arg His Glu Ala Tyr Glu

65 70 75 80

Ala Tyr Lys Ala Gly Arg Ala Pro Thr Pro Glu Asp Phe Pro Arg Gln

Leu	Ala	Leu	Ile	85	Lys	Glu	Leu	Val	Asp	90	Leu	Leu	Gly	Phe	Thr	95	Arg	Leu
Glu	Val	Pro	Gly	100	Tyr	Glu	Ala	Asp	105	Val	Leu	Ala	Thr	110	Leu	Ala	Lys	
Asn	Pro	Glu	Lys	115	Glu	Gly	Tyr	Glu	120	Val	Arg	Ile	Leu	125	Thr	Ala	Asp	Arg
Asp	Leu	Asp	Gln	130	Leu	Val	Ser	Asp	135	Arg	Val	Ala	Val	140	Leu	His	Pro	Glu
Gly	His	Leu	Ile	145	Thr	Pro	Glu	Trp	150	Leu	Trp	Gln	Lys	155	Tyr	Gly	Leu	Lys
Pro	Glu	Gln	Trp	165	Val	Asp	Phe	Arg	170	Ala	Leu	Val	Gly	175	Asp	Pro	Ser	Asp
Asn	Leu	Pro	Gly	180	Val	Lys	Gly	Ile	185	Gly	Glu	Lys	Thr	190	Ala	Leu	Lys	Leu
Leu	Lys	Glu	Trp	195	Gly	Ser	Leu	Glu	200	Asn	Leu	Leu	Lys	205	Asn	Leu	Asp	Arg
Val	Lys	Pro	Glu	210	Asn	Val	Arg	Glu	215	Lys	Ile	Lys	Ala	220	His	Leu	Glu	Asp
Leu	Arg	Leu	Ser	225	Leu	Glu	Leu	Ser	230	Arg	Val	Arg	Thr	235	Asp	Leu	Pro	Leu
Glu	Val	Asp	Leu	245	Ala	Gln	Gly	Arg	250	Glu	Pro	Asp	Arg	255	Glu	Gly	Leu	Arg
Ala	Phe	Leu	Glu	260	Arg	Leu	Glu	Phe	265	Gly	Ser	Leu	Leu	270	His	Glu	Phe	Gly
Leu	Leu	Glu	Ala	275	Pro	Ala	Pro	Leu	280	Glu	Glu	Ala	Pro	285	Trp	Pro	Pro	Pro
Glu	Gly	Ala	Phe	290	Val	Gly	Phe	Val	295	Leu	Ser	Arg	Pro	300	Glu	Pro	Met	Trp
Ala	Glu	Leu	Lys	305	Ala	Leu	Ala	Ala	310	Cys	Arg	Asp	Gly	315	Arg	Val	His	Arg
Ala	Ala	Asp	Pro	325	Leu	Ala	Gly	Leu	330	Lys	Asp	Leu	Lys	335	Glu	Val	Arg	Gly
Leu	Leu	Ala	Lys	340	Asp	Leu	Ala	Val	345	Leu	Ala	Ser	Arg	350	Glu	Gly	Leu	Asp
Leu	Val	Pro	Gly	355	Asp	Asp	Pro	Met	360	Leu	Leu	Ala	Tyr	365	Leu	Leu	Asp	Pro
Ser	Asn	Thr	Thr	370	Pro	Glu	Gly	Val	375	Ala	Arg	Arg	Tyr	380	Gly	Gly	Glu	Trp
Thr	Glu	Asp	Ala	385	Ala	His	Arg	Ala	390	Leu	Leu	Ser	Glu	395	Arg	Leu	His	Arg
Asn	Leu	Leu	Lys	405	Arg	Leu	Gln	Gly	410	Glu	Glu	Lys	Leu	415	Leu	Leu	Trp	Tyr
His	Glu	Val	Glu	420	Lys	Pro	Leu	Ser	425	Arg	Val	Leu	Ala	430	His	Met	Glu	Ala
Thr	Gly	Val	Arg	435	Leu	Asp	Val	Ala	440	Tyr	Leu	Gln	Ala	445	Leu	Ser	Leu	Glu
Leu	Ala	Glu	Glu	450	Ile	Arg	Arg	Leu	455	Glu	Glu	Glu	Val	460	Phe	Arg	Leu	Ala
Gly	His	Pro	Phe	465	Asn	Leu	Asn	Ser	470	Arg	Asp	Gln	Leu	475	Glu	Arg	Val	Leu
Phe	Asp	Glu	Leu	485	Arg	Leu	Pro	Ala	490	Leu	Gly	Lys	Thr	495	Gln	Lys	Thr	Gly
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Lys	Arg	Ser	Thr	515	Ser	Ala	Ala	Val	520	Leu	Glu	Ala	Leu	525	Arg	Glu	Ala	His
Pro	Ile	Val	Glu	530	Lys	Ile	Leu	Gln	535	His	Arg	Glu	Leu	540	Thr	Lys	Leu	Lys
Asn	Thr	Tyr	Val	545	Asp	Pro	Leu	Pro	550	Ser	Leu	Val	His	555	Pro	Asn	Thr	Gly
Arg	Leu	His	Thr	565	Arg	Phe	Asn	Gln	570	Thr	Ala	Thr	Ala	575	Thr	Gly	Arg	Leu
Ser	Ser	Ser	Asp	580	Pro	Asn	Leu	Gln	585	Ile	Pro	Val	Arg	590	Thr	Pro	Leu	
Gly	Gln	Arg	Ile	595	Arg	Arg	Ala	Phe	600	Val	Ala	Glu	Ala	605	Gly	Trp	Ala	Leu
Val	Ala	Leu	Asp		Tyr	Ser	Gln	Ile		Glu	Leu	Arg	Val		Leu	Ala	His	Leu

610	Ser	Gly	Asp	Glu	Asn	Leu	615	Ile	Arg	Val	Phe	Gln	620	Glu	Gly	Lys	Asp	Ile
625	His	Thr	Gln	Thr	Ala	Ser	630	Trp	Met	Phe	Gly	635	Val	Pro	Pro	Glu	Ala	Val
					645	Arg	Arg	Ala	Ala	Lys	650	Thr	Val	Asn	Phe	Gly	655	Val
	Asp	Pro	Leu	Met	660	Ser	Ala	His	Arg	Leu	665	Gln	Glu	Leu	Ala	Ile	Pro	Tyr
	Tyr	Gly	Met	675	Val	Ala	Phe	Ile	Glu	Arg	Tyr	Phe	Gln	Ser	Phe	Pro	Lys	
	Glu	Glu	Ala	690	Val	Arg	Ala	Trp	Ile	Glu	Lys	Thr	Leu	Glu	Gly	Arg	Lys	Arg
	Val	Arg	Ala	705	Val	Glu	Thr	Leu	Phe	Gly	Arg	Arg	Arg	Tyr	Val	Pro	Asp	Leu
	Tyr	Val	Glu	725	Thr	Leu	Phe	Gly	Arg	Arg	Arg	730	Thr	Val	Pro	Asp	Leu	Asn
	Ala	Arg	Val	740	Lys	Ser	Val	Arg	Glu	Ala	745	Ala	Glu	Arg	Met	Ala	Phe	Asn
	Met	Pro	Val	755	Gln	Gly	Thr	Ala	Ala	760	Asp	Leu	Met	Lys	Leu	Ala	Met	Val
	Lys	Leu	Phe	770	Pro	Arg	Leu	Arg	Glu	775	Met	Gly	Ala	Arg	Met	Leu	Leu	Gln
	Val	His	Asp	785	Glu	Leu	Leu	Glu	Ala	790	Pro	Gln	Ala	Gly	Ala	Glu	Glu	
	Val	Ala	Ala	805	Leu	Ala	Lys	Glu	Ala	810	Met	Glu	Lys	Ala	Tyr	Pro	Leu	Ala
	Val	Pro	Leu	820	Glu	Val	Glu	Val	Gly	825	Met	Gly	Glu	Asp	Trp	Leu	Ser	Ala
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<223> synthetic polymerase domain motif of DNA polymerase

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<223> Xaa = Ser, Arg, Asn or Ala

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 1 5 10 15

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Ser Thr Xaa Xaa Xaa Val Leu Xaa Xaa Xaa Xaa Xaa Xaa His Xaa Ile
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<400> 11
Ser Thr Ser Ala Ala Val Leu Gly Ala Leu Arg Glu Ala His Pro Ile
1 5 10 15

<210> 12
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Thermus sp. Z05 DNA polymerase (Z05)

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 Arg Glu Ala His Pro Ile Val Glu Lys Ile Leu Gln
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 Arg Glu Ala His Pro Ile Val Gly Arg Ile Leu Glu
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 Arg Glu Ala His Pro Ile Val Asp Arg Ile Leu Gln
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 Arg Glu Ala His Pro Ile Val Gly Arg Ile Leu Glu
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<400> 17
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 Arg Glu Ala His Pro Ile Val Glu Lys Ile Leu Gln
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 1 5 10 15
 Ala Gly Glu His Glu Ile Ile Pro Leu Ile Leu Glu
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<220>
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 Thermotoga neopolitana DNA polymerase (Tne)

<400> 20
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1 5 10 15
Ala Asn Glu His Glu Ile Val Pro Leu Ile Leu Glu
20 25

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<220>
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Ser Lys Glu His Glu Ile Ala Lys Leu Leu Leu Glu
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Deinococcus radiodurans DNA polymerase (Dra)

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1 5 10 15
Arg Asp Ala His Pro Ile Ile Pro Leu Val Leu Glu
20 25

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<212> PRT
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Bacillus stearothermophilus DNA polymerase (Bst)

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1 5 10 15
Ala Pro His His Glu Ile Val Glu His Ile Leu
20 25

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 Bacillus caldotenax DNA polymerase (Bca)

 <400> 25
 Lys Ser Lys Thr Gly Tyr Ser Thr Ser Ala Asp Val Leu Glu Lys Leu
 1 5 10 15
 Ala Pro Tyr His Glu Ile Val Glu Asn Ile Leu Gln
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 DNA polymerase consensus sequence

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 <223> Xaa = Ala, Glu, His or Tyr

<220>
 <221> VARIANT
 <222> (15)...(15)
 <223> Xaa = Pro or Glu

<400> 26
 Ser Thr Xaa Xaa Xaa Xaa Leu Glu Xaa Xaa Xaa Xaa His Xaa Ile
 1 5 10 15

<210> 27
 <211> 893
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> synthetic chimeric CS5 DNA polymerase derived from
 N-terminal 5'-nuclease domain of Thermus sp. Z05
 and C-terminal 3'-5' exonuclease and polymerase
 domains of Thermotoga maritima DNA polymerases

<400> 27
 Met Lys Ala Met Leu Pro Leu Phe Glu Pro Lys Gly Arg Val Leu Leu
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 Val Asp Gly His His Leu Ala Tyr Arg Thr Phe Phe Ala Leu Lys Gly
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 Leu Thr Thr Ser Arg Gly Glu Pro Val Gln Ala Val Tyr Gly Phe Ala
 35 40 45
 Lys Ser Leu Leu Lys Ala Leu Lys Glu Asp Gly Tyr Lys Ala Val Phe
 50 55 60
 Val Val Phe Asp Ala Lys Ala Pro Ser Phe Arg His Glu Ala Tyr Glu
 65 70 75 80
 Ala Tyr Lys Ala Gly Arg Ala Pro Thr Pro Glu Asp Phe Pro Arg Gln
 85 90 95
 Leu Ala Leu Ile Lys Glu Leu Val Asp Leu Leu Gly Phe Thr Arg Leu
 100 105 110
 Glu Val Pro Gly Phe Glu Ala Asp Asp Val Leu Ala Thr Leu Ala Lys
 115 120 125
 Lys Ala Glu Arg Glu Gly Tyr Glu Val Arg Ile Leu Thr Ala Asp Arg
 130 135 140
 Asp Leu Tyr Gln Leu Val Ser Asp Arg Val Ala Val Leu His Pro Glu
 145 150 155 160
 Gly His Leu Ile Thr Pro Glu Trp Leu Trp Glu Lys Tyr Gly Leu Lys
 165 170 175
 Pro Glu Gln Trp Val Asp Phe Arg Ala Leu Val Gly Asp Pro Ser Asp
 180 185 190
 Asn Leu Pro Gly Val Lys Gly Ile Gly Glu Lys Thr Ala Leu Lys Leu
 195 200 205
 Leu Lys Glu Trp Gly Ser Leu Glu Asn Ile Leu Lys Asn Leu Asp Arg
 210 215 220
 Val Lys Pro Glu Ser Val Arg Glu Arg Ile Lys Ala His Leu Glu Asp
 225 230 235 240
 Leu Lys Leu Ser Leu Glu Leu Ser Arg Val Arg Ser Asp Leu Pro Leu
 245 250 255
 Glu Val Asp Phe Ala Arg Arg Arg Glu Pro Asp Arg Glu Gly Leu Arg
 260 265 270
 Ala Phe Leu Glu Arg Leu Glu Phe Gly Ser Leu Leu His Glu Phe Gly
 275 280 285
 Leu Leu Glu Glu Ser Glu Pro Val Gly Tyr Arg Ile Val Lys Asp Leu
 290 295 300
 Val Glu Phe Glu Lys Leu Ile Glu Lys Leu Arg Glu Ser Pro Ser Phe
 305 310 315 320
 Ala Ile Asp Leu Glu Thr Ser Ser Leu Asp Pro Phe Asp Cys Asp Ile

Val	Gly	Ile	Ser	325	Val	Ser	Phe	Lys	Pro	330	Lys	Glu	Ala	Tyr	Tyr	335	Ile	Pro
Leu	His	His	Arg	340	Asn	Ala	Gln	Asn	Leu	345	Asp	Glu	Lys	Glu	Val	350	Leu	Lys
Lys	Leu	Lys	Glu	355	Ile	Leu	Glu	Asp	Pro	360	Gly	Ala	Lys	Ile	Val	365	Gly	Gln
Asn	Leu	Lys	Phe	370	Asp	Tyr	Lys	Val	Leu	375	Met	Val	Lys	Gly	Val	380	Glu	Pro
385	Val	Pro	Pro	390	Phe	Asp	Thr	Met	Ile	395	Ala	Ala	Tyr	Leu	Leu	400	Glu	Pro
Val	Glu	Lys	Lys	405	Phe	Asn	Leu	Asp	Asp	410	Leu	Ala	Leu	Lys	Phe	415	Leu	Gly
Tyr	Lys	Met	Thr	420	Ser	Tyr	Gln	Glu	Leu	425	Met	Ser	Phe	Ser	Phe	430	Pro	Leu
Phe	Gly	Phe	Ser	435	Phe	Ala	Asp	Val	Pro	440	Val	Glu	Lys	Ala	Ala	445	Asn	Tyr
Ser	Cys	Glu	Asp	450	Ala	Asp	Ile	Thr	Tyr	455	Arg	Leu	Tyr	Lys	Thr	460	Leu	Ser
465	Leu	Lys	Leu	470	Glu	Ala	Asp	Leu	Glu	475	Asn	Val	Phe	Tyr	Lys	480	Ile	Glu
Met	Pro	Leu	Val	485	Asn	Val	Leu	Ala	Arg	490	Met	Glu	Leu	Asn	Gly	495	Val	Tyr
Val	Asp	Thr	Glu	500	Phe	Leu	Lys	Lys	Leu	505	Ser	Glu	Glu	Tyr	Gly	510	Lys	Lys
Leu	Glu	Glu	Leu	515	Ala	Glu	Glu	Ile	Tyr	520	Arg	Ile	Ala	Gly	Glu	525	Pro	Phe
Asn	Ile	Asn	Ser	530	Pro	Lys	Gln	Val	Ser	535	Arg	Ile	Leu	Phe	Glu	540	Lys	Leu
545	Gly	Ile	Lys	550	Arg	Gly	Lys	Thr	Thr	555	Lys	Thr	Gly	Asp	Tyr	560	Ser	Thr
Arg	Ile	Glu	Val	565	Leu	Glu	Glu	Leu	Ala	570	Gly	Glu	His	Glu	Ile	575	Ile	Pro
Leu	Ile	Leu	Glu	580	Tyr	Arg	Lys	Ile	Gln	585	Lys	Leu	Lys	Ser	Thr	590	Tyr	Ile
Asp	Ala	Leu	Pro	595	Lys	Met	Val	Asn	Pro	600	Lys	Thr	Gly	Arg	Ile	605	His	Ala
Ser	Phe	Asn	Gln	610	Thr	Gly	Thr	Ala	Thr	615	Gly	Arg	Leu	Ser	Ser	620	Ser	Asp
625	Pro	Asn	Leu	630	Asn	Leu	Pro	Thr	Lys	635	Ser	Glu	Glu	Gly	Lys	640	Glu	Ile
Arg	Lys	Ala	Ile	645	Val	Pro	Gln	Asp	Pro	650	Asn	Trp	Trp	Ile	Val	655	Ser	Ala
Asp	Tyr	Ser	Gln	660	Ile	Glu	Leu	Arg	Ile	665	Leu	Ala	His	Leu	Ser	670	Gly	Asp
Glu	Asn	Leu	Leu	675	Arg	Ala	Phe	Glu	Glu	680	Gly	Ile	Asp	Val	His	685	Thr	Leu
Thr	Ala	Ser	Arg	690	Ile	Phe	Asn	Val	Lys	695	Pro	Glu	Glu	Val	Thr	700	Glu	Glu
705	Met	Arg	Arg	710	Gly	Lys	Met	Val	Asn	715	Phe	Ser	Ile	Ile	Tyr	720	Gly	Val
Thr	Pro	Tyr	Gly	725	Leu	Ser	Val	Arg	Leu	730	Gly	Val	Pro	Val	Lys	735	Glu	Ala
			740						745						750			
Glu	Lys	Met	Ile	755	Val	Asn	Tyr	Phe	Val	760	Leu	Tyr	Pro	Lys	Val	765	Arg	Asp
Tyr	Ile	Gln	Arg	770	Val	Val	Ser	Glu	Ala	775	Lys	Glu	Lys	Gly	Tyr	780	Val	Arg
Thr	Leu	Phe	Gly	785	Arg	Lys	Arg	Asp	Ile	790	Pro	Gln	Leu	Met	Ala	795	Arg	Asp
Arg	Asn	Thr	Gln	800	Ala	Glu	Gly	Glu	Arg	805	Ile	Ala	Ile	Asn	Thr	810	Pro	Ile
Gln	Gly	Thr	Ala	815	Ala	Asp	Ile	Ile	Lys	820	Leu	Ala	Met	Ile	Glu	825	Ile	Asp
Arg	Glu	Leu	Lys	830	Glu	Arg	Lys	Met	Arg	835	Ser	Lys	Met	Ile	Gln	840	Val	
His	Asp	Glu	Leu	845	Val	Phe	Glu	Val	Pro	850	Asn	Glu	Glu	Lys	Asp	855	Ala	Leu

Val	850	Glu	Leu	Val	Lys	Asp	855	Arg	Met	Thr	Asn	Val	860	Val	Lys	Leu	Ser	Val
865						870						875						880
Pro	Leu	Glu	Val	Asp	885	Val	Thr	Ile	Gly	Lys	890	Thr	Trp	Ser				

<210> 28
 <211> 893
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> synthetic chimeric CS6 DNA polymerase derived from
 N-terminal 5'-nuclease domain of Thermus sp. Z05
 and C-terminal 3'-5' exonuclease and polymerase
 domains of Thermotoga maritima DNA polymerases

<400> 28

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Val	Asp	Gly	His	Leu	Ala	Tyr	Arg	Thr	Phe	Phe	Ala	Leu	Lys	Gly	
			20				25					30			
Leu	Thr	Thr	Ser	Arg	Gly	Glu	Pro	Val	Gln	Ala	Val	Tyr	Gly	Phe	Ala
		35				40					45				
Lys	Ser	Leu	Leu	Lys	Ala	Leu	Lys	Glu	Asp	Gly	Tyr	Lys	Ala	Val	Phe
	50				55					60					
Val	Val	Phe	Asp	Ala	Lys	Ala	Pro	Ser	Phe	Arg	His	Glu	Ala	Tyr	Glu
65				70					75						80
Ala	Tyr	Lys	Ala	Gly	Arg	Ala	Pro	Thr	Pro	Glu	Asp	Phe	Pro	Arg	Gln
			85					90					95		
Leu	Ala	Leu	Ile	Lys	Glu	Leu	Val	Asp	Leu	Leu	Gly	Phe	Thr	Arg	Leu
			100					105					110		
Glu	Val	Pro	Gly	Phe	Glu	Ala	Asp	Asp	Val	Leu	Ala	Thr	Leu	Ala	Lys
		115					120					125			
Lys	Ala	Glu	Arg	Glu	Gly	Tyr	Glu	Val	Arg	Ile	Leu	Thr	Ala	Asp	Arg
	130				135					140					
Asp	Leu	Tyr	Gln	Leu	Val	Ser	Asp	Arg	Val	Ala	Val	Leu	His	Pro	Glu
145				150					155						160
Gly	His	Leu	Ile	Thr	Pro	Glu	Trp	Leu	Trp	Glu	Lys	Tyr	Gly	Leu	Lys
			165					170						175	
Pro	Glu	Gln	Trp	Val	Asp	Phe	Arg	Ala	Leu	Val	Gly	Asp	Pro	Ser	Asp
			180				185					190			
Asn	Leu	Pro	Gly	Val	Lys	Gly	Ile	Gly	Glu	Lys	Thr	Ala	Leu	Lys	Leu
		195				200						205			
Leu	Lys	Glu	Trp	Gly	Ser	Leu	Glu	Asn	Ile	Leu	Lys	Asn	Leu	Asp	Arg
	210					215					220				

Val	Lys	Pro	Glu	Ser	Val	Arg	Glu	Arg	Ile	Lys	Ala	His	Leu	Glu	Asp
225					230					235					240
Leu	Lys	Leu	Ser	Leu	Glu	Leu	Ser	Arg	Val	Arg	Ser	Asp	Leu	Pro	Leu
			245						250				255		
Glu	Val	Asp	Phe	Ala	Arg	Arg	Arg	Glu	Pro	Asp	Arg	Glu	Gly	Leu	Arg
		260						265					270		
Ala	Phe	Leu	Glu	Arg	Leu	Glu	Phe	Gly	Ser	Leu	Leu	His	Glu	Phe	Gly
		275				280						285			
Leu	Leu	Glu	Glu	Ser	Glu	Pro	Val	Gly	Tyr	Arg	Ile	Val	Lys	Asp	Leu
	290				295					300					
Val	Glu	Phe	Glu	Lys	Leu	Ile	Glu	Lys	Leu	Arg	Glu	Ser	Pro	Ser	Phe
305				310					315						320
Ala	Ile	Ala	Leu	Ala	Thr	Ser	Ser	Leu	Asp	Pro	Phe	Asp	Cys	Asp	Ile
			325					330					335		
Val	Gly	Ile	Ser	Val	Ser	Phe	Lys	Pro	Lys	Glu	Ala	Tyr	Tyr	Ile	Pro
		340					345					350			
Leu	His	His	Arg	Asn	Ala	Gln	Asn	Leu	Asp	Glu	Lys	Glu	Val	Leu	Lys
	355					360						365			
Lys	Leu	Lys	Glu	Ile	Leu	Glu	Asp	Pro	Gly	Ala	Lys	Ile	Val	Gly	Gln

Asn 385	Leu 370	Lys	Phe	Asp	Tyr 390	Lys 375	Val	Leu	Met	Val 395	Lys 380	Gly	Val	Glu	Pro 400
Val	Pro	Pro	Tyr	Phe 405	Asp	Thr	Met	Ile	Ala 410	Ala	Tyr	Leu	Leu	Glu 415	Pro
Asn	Glu	Lys	Lys 420	Phe	Asn	Leu	Asp	Asp 425	Leu	Ala	Leu	Lys	Phe 430	Leu	Gly
Tyr	Lys	Met 435	Thr	Ser	Tyr	Gln	Glu 440	Leu	Met	Ser	Phe	Ser 445	Phe	Pro	Leu
Phe	Gly 450	Phe	Ser	Phe	Ala	Asp 455	Val	Pro	Val	Glu	Lys 460	Ala	Ala	Asn	Tyr
Ser 465	Cys	Glu	Asp	Ala	Asp 470	Ile	Thr	Tyr	Arg	Leu 475	Tyr	Lys	Thr	Leu	Ser 480
Leu	Lys	Leu	His	Glu 485	Ala	Asp	Leu	Glu	Asn 490	Val	Phe	Tyr	Lys	Ile 495	Glu
Met	Pro	Leu	Val 500	Asn	Val	Leu	Ala	Arg 505	Met	Glu	Leu	Asn	Gly 510	Val	Tyr
Val	Asp	Thr 515	Glu	Phe	Leu	Lys	Lys 520	Leu	Ser	Glu	Glu	Tyr 525	Gly	Lys	Lys
Leu	Glu 530	Glu	Leu	Ala	Glu	Glu 535	Ile	Tyr	Arg	Ile	Ala 540	Gly	Glu	Pro	Phe
Asn 545	Ile	Asn	Ser	Pro	Lys 550	Gln	Val	Ser	Arg	Ile 555	Leu	Phe	Glu	Lys	Leu 560
Gly	Ile	Lys	Pro	Arg 565	Gly	Lys	Thr	Thr	Lys 570	Thr	Gly	Asp	Tyr	Ser 575	Thr
Arg	Ile	Glu	Val 580	Leu	Glu	Glu	Leu	Ala 585	Gly	Glu	His	Glu	Ile 590	Ile	Pro
Leu	Ile	Leu 595	Glu	Tyr	Arg	Lys	Ile 600	Gln	Lys	Leu	Lys	Ser 605	Thr	Tyr	Ile
Asp	Ala 610	Leu	Pro	Lys	Met	Val 615	Asn	Pro	Lys	Thr	Gly 620	Arg	Ile	His	Ala
Ser 625	Phe	Asn	Gln	Thr	Gly 630	Thr	Ala	Thr	Gly	Arg 635	Leu	Ser	Ser	Ser	Asp 640
Pro	Asn	Leu	Gln	Asn 645	Leu	Pro	Thr	Lys	Ser 650	Glu	Glu	Gly	Lys	Glu 655	Ile
Arg	Lys	Ala	Ile 660	Val	Pro	Gln	Asp	Pro 665	Asn	Trp	Trp	Ile	Val 670	Ser	Ala
Asp	Tyr	Ser 675	Gln	Ile	Glu	Leu	Arg 680	Ile	Leu	Ala	His	Leu 685	Ser	Gly	Asp
Glu	Asn 690	Leu	Leu	Arg	Ala	Phe 695	Glu	Glu	Gly	Ile	Asp 700	Val	His	Thr	Leu
Thr 705	Ala	Ser	Arg	Ile	Phe 710	Asn	Val	Lys	Pro	Glu 715	Glu	Val	Thr	Glu	Glu 720
Met	Arg	Arg	Ala	Gly 725	Lys	Met	Val	Asn	Phe 730	Ser	Ile	Ile	Tyr	Gly 735	Val
Thr	Pro	Tyr	Gly 740	Leu	Ser	Val	Arg	Leu 745	Gly	Val	Pro	Val	Lys 750	Glu	Ala
Glu	Lys	Met 755	Ile	Val	Asn	Tyr	Phe 760	Val	Leu	Tyr	Pro	Lys 765	Val	Arg	Asp
Tyr	Ile	Gln	Arg	Val	Val	Ser 775	Glu	Ala	Lys	Glu	Lys 780	Gly	Tyr	Val	Arg
Thr 785	Leu	Phe	Gly	Arg	Lys 790	Arg	Asp	Ile	Pro	Gln 795	Leu	Met	Ala	Arg	Asp 800
Arg	Asn	Thr	Gln	Ala 805	Glu	Gly	Glu	Arg	Ile 810	Ala	Ile	Asn	Thr	Pro 815	Ile
Gln	Gly	Thr	Ala 820	Ala	Asp	Ile	Ile	Lys 825	Leu	Ala	Met	Ile	Glu 830	Ile	Asp
Arg	Glu	Leu 835	Lys	Glu	Arg	Lys	Met 840	Arg	Ser	Lys	Met	Ile 845	Ile	Gln	Val
His	Asp 850	Glu	Leu	Val	Phe	Glu 855	Val	Pro	Asn	Glu	Glu 860	Lys	Asp	Ala	Leu
Val 865	Glu	Leu	Val	Lys	Asp 870	Arg	Met	Thr	Asn	Val 875	Val	Lys	Leu	Ser	Val 880
Pro	Leu	Glu	Val	Asp 885	Val	Thr	Ile	Gly	Lys 890	Thr	Trp	Ser			

<210> 29
 <211> 16
 <212> PRT
 <213> Artificial Sequence

 <220>
 <223> synthetic polymerase domain motif of DNA polymerase

 <220>
 <221> VARIANT
 <222> (8)...(8)
 <223> Xaa = an amino acid having a nonpolar, uncharged
 side chain, e.g., Gly, Ala, Leu, Met, Trp, Pro,
 Phe, Cys, Val or Ile

 <400> 29
 Ser Thr Ser Ala Ala Val Leu Xaa Ala Leu Arg Glu Ala His Pro Ile
 1 5 10 15

<210> 30
 <211> 21
 <212> DNA
 <213> Artificial Sequence

<220>
 <223> synthetic error-prone (mutagenic) PCR
 amplification forward primer

<400> 30
 ctacctcctg gacccctcca a 21

<210> 31
 <211> 25
 <212> DNA
 <213> Artificial Sequence
 <220>
 <223> synthetic error-prone (mutagenic) PCR
 amplification reverse primer

<400> 31
 ataaccaact ggtagtggcg tgtaa 25

<210> 32
 <211> 921
 <212> PRT
 <213> Deinococcus radiodurans

<220>
 <223> Deinococcus radiodurans DNA polymerase (Dra)

<400> 32
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 Ile Asp Gly His Ala Leu Ala Phe Arg Ser Tyr Phe Ala Leu Pro Pro
 20 25 30
 Leu Asn Asn Ser Lys Gly Glu Met Thr Asp Ala Ile Val Gly Phe Met
 35 40 45
 Lys Leu Leu Leu Arg Leu Ala Arg Gln Lys Ser Asn Gln Val Ile Val
 50 55 60
 Val Phe Asp Pro Pro Val Lys Thr Leu Arg His Glu Gln Tyr Glu Gly
 65 70 75 80
 Tyr Lys Ser Gly Arg Ala Gln Thr Pro Glu Asp Leu Arg Gly Gln Ile
 85 90 95
 Asn Arg Ile Arg Ala Leu Val Asp Ala Leu Gly Phe Pro Arg Leu Glu
 100 105 110
 Glu Pro Gly Tyr Glu Ala Asp Asp Val Ile Ala Ser Leu Thr Arg Met

Thr	Ala	Val	Ala	645	Thr	Gly	Arg	Leu	Ser	650	Ser	Leu	Asn	Pro	Asn	655	Leu	Gln
Asn	Ile	Pro	660	Ile	Arg	Ser	Glu	Leu	665	Gly	Arg	Glu	Ile	Arg	670	Lys	Gly	Phe
Ile	Ala	675	Glu	Asp	Gly	Phe	Thr	680	Leu	Ile	Ala	Ala	Asp	685	Tyr	Ser	Gln	Ile
690	Glu	Leu	Arg	Leu	Leu	Ala	His	Ile	Ala	Asp	Asp	Pro	Leu	Met	Gln	Gln		
705	Ala	Phe	Val	Glu	710	Gly	Ala	Asp	Ile	His	Arg	Arg	Thr	Ala	Ala	Gln	Val	
Leu	Gly	Leu	Asp	725	Glu	Ala	Thr	Val	Asp	730	Ala	Asn	Gln	Arg	Arg	Ala	Ala	
Lys	Thr	Val	Asn	740	Phe	Gly	Val	Leu	745	Tyr	Gly	Met	Ser	Ala	His	Arg	Leu	
Ser	Asn	Asp	Leu	Gly	Ile	Pro	755	Tyr	Ala	Glu	Ala	Ala	Thr	Phe	Ile	Glu		
770	Ile	Tyr	Phe	Ala	Thr	Tyr	Pro	Gly	Ile	Arg	Arg	Tyr	Ile	Asn	His	Thr		
785	Leu	Asp	Phe	Gly	Arg	Thr	His	Gly	Tyr	Val	795	Glu	Thr	Leu	Tyr	Gly	Arg	
Arg	Arg	Tyr	Val	805	Pro	Gly	Leu	Ser	Ser	810	Arg	Asn	Arg	Val	Gln	Arg	Glu	
			820						825						830			
Ala	Glu	Glu	Arg	Leu	Ala	Tyr	Asn	Met	Pro	Ile	Gln	Gly	Thr	Ala	Ala			
Asp	Ile	Met	Lys	Leu	Ala	Met	835	Val	Gln	Leu	Asp	Pro	Gln	Leu	Asp	Ala		
850	Ile	Gly	Ala	Arg	Met	Leu	Leu	Gln	Val	His	Asp	Glu	Leu	Leu	Ile	Glu		
865	Ala	Pro	Leu	Asp	Lys	Ala	Glu	Gln	Val	Ala	875	Ala	Leu	Thr	Lys	Lys	Val	
				885						890								
Met	Glu	Asn	Val	900	Gln	Leu	Lys	Val	905	Pro	Leu	Ala	Val	Glu	Val	Gly		
Thr	Gly	Pro	Asn	Trp	Phe	Asp	Thr	Lys						910				
		915					920											

<210> 33

<211> 892

<212> PRT

<213> Thermosipho africanus

<220>

<223> Thermosipho africanus DNA polymerase (Taf)

<400> 33

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Phe	Tyr	Ala	Ile	Asp	Gln	Ser	Leu	Gln	Thr	Ser	Ser	Gly	Leu	His	Thr
		20						25					30		
Asn	Ala	Val	Tyr	Gly	Leu	Thr	Lys	Met	Leu	Ile	Lys	Phe	Leu	Lys	Glu
		35					40					45			
His	Ile	Ser	Ile	Gly	Lys	Asp	Ala	Cys	Val	Phe	Val	Leu	Asp	Ser	Lys
	50					55				60					
Gly	Gly	Ser	Lys	Lys	Arg	Lys	Asp	Ile	Leu	Glu	Thr	Tyr	Lys	Ala	Asn
65					70					75				80	
Arg	Pro	Ser	Thr	Pro	Asp	Leu	Leu	Leu	Glu	Gln	Ile	Pro	Tyr	Val	Glu
				85					90					95	
Glu	Leu	Val	Asp	Ala	Leu	Gly	Ile	Lys	Val	Leu	Lys	Ile	Glu	Gly	Phe
			100					105					110		
Glu	Ala	Asp	Asp	Ile	Ile	Ala	Thr	Leu	Ser	Lys	Lys	Phe	Glu	Ser	Asp
		115					120					125			
Phe	Glu	Lys	Val	Asn	Ile	Ile	Thr	Gly	Asp	Lys	Asp	Leu	Leu	Gln	Leu
	130					135					140				
Val	Ser	Asp	Lys	Val	Phe	Val	Trp	Arg	Val	Glu	Arg	Gly	Ile	Thr	Asp
145					150					155					160

Leu	Val	Leu	Tyr	Asp	Arg	Asn	Lys	Val	Ile	Glu	Lys	Tyr	Gly	Ile	Tyr
Pro	Glu	Gln	Phe	Lys	Asp	Tyr	Leu	Ser	Leu	Val	Gly	Asp	Gln	Ile	Asp
Asn	Ile	Pro	Gly	Val	Lys	Gly	Ile	Gly	Lys	Lys	Thr	Ala	Val	Ser	Leu
Leu	Lys	Lys	Tyr	Asn	Ser	Leu	Glu	Asn	Val	Leu	Lys	Asn	Ile	Asn	Leu
Leu	Thr	Glu	Lys	Leu	Arg	Arg	Leu	Leu	Glu	Asp	Ser	Lys	Glu	Asp	Leu
Gln	Lys	Ser	Ile	Glu	Leu	Val	Glu	Leu	Ile	Tyr	Asp	Val	Pro	Met	Asp
Val	Glu	Lys	Asp	Glu	Ile	Ile	Tyr	Arg	Gly	Tyr	Asn	Pro	Asp	Lys	Leu
Leu	Lys	Val	Leu	Lys	Lys	Tyr	Glu	Phe	Ser	Ser	Ile	Ile	Lys	Glu	Leu
Asn	Leu	Gln	Glu	Lys	Leu	Glu	Lys	Glu	Tyr	Ile	Leu	Val	Asp	Asn	Glu
Asp	Lys	Leu	Lys	Lys	Leu	Ala	Glu	Glu	Ile	Glu	Lys	Tyr	Lys	Thr	Phe
Ser	Ile	Asp	Thr	Glu	Thr	Thr	Ser	Leu	Asp	Pro	Phe	Glu	Ala	Lys	Leu
Val	Gly	Ile	Ser	Ile	Ser	Thr	Met	Glu	Gly	Lys	Ala	Tyr	Tyr	Ile	Pro
Val	Ser	His	Phe	Gly	Ala	Lys	Asn	Ile	Ser	Lys	Ser	Leu	Ile	Asp	Lys
Phe	Leu	Lys	Gln	Ile	Leu	Gln	Glu	Lys	Asp	Tyr	Asn	Ile	Val	Gly	Gln
Asn	Leu	Lys	Phe	Asp	Tyr	Glu	Ile	Phe	Lys	Ser	Met	Gly	Phe	Ser	Pro
Asn	Val	Pro	His	Phe	Asp	Thr	Met	Ile	Ala	Ala	Tyr	Leu	Leu	Asn	Pro
Asp	Glu	Lys	Arg	Phe	Asn	Leu	Glu	Glu	Leu	Ser	Leu	Lys	Tyr	Leu	Gly
Tyr	Lys	Met	Ile	Ser	Phe	Asp	Glu	Leu	Val	Asn	Glu	Asn	Val	Pro	Leu
Phe	Gly	Asn	Asp	Phe	Ser	Tyr	Val	Pro	Leu	Glu	Arg	Ala	Val	Glu	Tyr
Ser	Cys	Glu	Asp	Ala	Asp	Val	Thr	Tyr	Arg	Ile	Phe	Arg	Lys	Leu	Gly
Arg	Lys	Ile	Tyr	Glu	Asn	Glu	Met	Glu	Lys	Leu	Phe	Tyr	Glu	Ile	Glu
Met	Pro	Leu	Ile	Asp	Val	Leu	Ser	Glu	Met	Glu	Leu	Asn	Gly	Val	Tyr
Phe	Asp	Glu	Glu	Tyr	Leu	Lys	Glu	Leu	Ser	Lys	Lys	Tyr	Gln	Glu	Lys
Met	Asp	Gly	Ile	Lys	Glu	Lys	Val	Phe	Glu	Ile	Ala	Gly	Glu	Thr	Phe
Asn	Leu	Asn	Ser	Ser	Thr	Gln	Val	Ala	Tyr	Ile	Leu	Phe	Glu	Lys	Leu
Asn	Ile	Ala	Pro	Tyr	Lys	Lys	Thr	Ala	Thr	Gly	Lys	Phe	Ser	Thr	Asn
Ala	Glu	Val	Leu	Glu	Glu	Leu	Ser	Lys	Glu	His	Glu	Ile	Ala	Lys	Leu
Leu	Leu	Glu	Tyr	Arg	Lys	Tyr	Gln	Lys	Leu	Lys	Ser	Thr	Tyr	Ile	Asp
Ser	Ile	Pro	Leu	Ser	Ile	Asn	Arg	Lys	Thr	Asn	Arg	Val	His	Thr	Thr
Phe	His	Gln	Thr	Gly	Thr	Ser	Thr	Gly	Arg	Leu	Ser	Ser	Ser	Asn	Pro
Asn	Leu	Gln	Asn	Leu	Pro	Thr	Arg	Ser	Glu	Glu	Gly	Lys	Glu	Ile	Arg
Lys	Ala	Val	Arg	Pro	Gln	Arg	Gln	Asp	Trp	Trp	Ile	Leu	Gly	Ala	Asp
Tyr	Ser	Gln	Ile	Glu	Leu	Arg	Val	Leu	Ala	His	Val	Ser	Lys	Asp	Glu
Asn	Leu	Leu	Lys	Ala	Phe	Lys	Glu	Asp	Leu	Asp	Ile	His	Thr	Ile	Thr

Ala 690	Ala	Lys	Ile	Phe	Gly 695	Val	Ser	Glu	Met	Phe 700	Val	Ser	Glu	Gln	Met
705	Arg	Arg	Val	Gly	Lys 710	Met	Val	Asn	Phe	Ala 715	Ile	Ile	Tyr	Gly	Val
					725					730					735
Pro	Tyr	Gly	Leu	Ser	Lys	Arg	Ile	Gly	Leu	Ser	Val	Ser	Glu	Thr	Lys
			740					745					750		
Lys	Ile	Ile	Asp	Asn	Tyr	Phe	Arg	Tyr	Tyr	Lys	Gly	Val	Phe	Glu	Tyr
		755					760					765			
Leu	Lys	Arg	Met	Lys	Asp	Glu	Ala	Arg	Lys	Lys	Gly	Tyr	Val	Thr	Thr
	770					775					780				
Leu 785	Phe	Gly	Arg	Arg	Arg	Tyr	Ile	Pro	Gln	Leu	Arg	Ser	Lys	Asn	Gly
					790					795					800
Asn	Arg	Val	Gln	Glu	Gly	Glu	Arg	Ile	Ala	Val	Asn	Thr	Pro	Ile	Gln
				805					810					815	
Gly	Thr	Ala	Ala	Asp	Ile	Ile	Lys	Ile	Ala	Met	Ile	Asn	Ile	His	Asn
			820					825					830		
Arg	Leu	Lys	Lys	Glu	Asn	Leu	Arg	Ser	Lys	Met	Ile	Leu	Gln	Val	His
		835					840					845			
Asp	Glu	Leu	Val	Phe	Glu	Val	Pro	Asp	Asn	Glu	Leu	Glu	Ile	Val	Lys
	850					855					860				
Asp	Leu	Val	Arg	Asp	Glu	Met	Glu	Asn	Ala	Val	Lys	Leu	Asp	Val	Pro
865					870					875					880
Leu	Lys	Val	Asp	Val	Tyr	Tyr	Gly	Lys	Glu	Trp	Glu				
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 <212> PRT
 <213> Thermotoga maritima

<220>
 <223> Thermotoga maritima DNA polymerase (Tma)

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

Leu	Ser	Lys	Lys	Leu	Ala	Ile	Leu	Glu	Thr	Asn	Val	Pro	Ile	Glu	Ile
Asn	Trp	Glu	Glu	Leu	Arg	Tyr	Gln	Gly	Tyr	Asp	Arg	Glu	Lys	Leu	Leu
Pro	Leu	Leu	Lys	Glu	Leu	Glu	Phe	Ala	Ser	Ile	Met	Lys	Glu	Leu	Gln
Leu	Tyr	Glu	Glu	Ser	Glu	Pro	Val	Gly	Tyr	Arg	Ile	Val	Lys	Asp	Leu
Val	Glu	Phe	Glu	Lys	Leu	Ile	Glu	Lys	Leu	Arg	Glu	Ser	Pro	Ser	Phe
Ala	Ile	Asp	Leu	Glu	Thr	Ser	Ser	Leu	Asp	Pro	Phe	Asp	Cys	Asp	Ile
Val	Gly	Ile	Ser	Val	Ser	Phe	Lys	Pro	Lys	Glu	Ala	Tyr	Tyr	Ile	Pro
Leu	His	His	Arg	Asn	Ala	Gln	Asn	Leu	Asp	Glu	Lys	Glu	Val	Leu	Lys
Lys	Leu	Lys	Glu	Ile	Leu	Glu	Lys	Val	Leu	Met	Val	Lys	Gly	Val	Glu
Asn	Leu	Lys	Phe	Asp	Tyr	Lys	Val	Leu	Met	Val	Lys	Gly	Val	Glu	Pro
Val	Pro	Pro	Tyr	Phe	Asp	Thr	Met	Ile	Ala	Ala	Tyr	Leu	Leu	Glu	Pro
Asn	Glu	Lys	Lys	Phe	Asn	Leu	Asp	Asp	Leu	Ala	Leu	Lys	Phe	Leu	Gly
Tyr	Lys	Met	Thr	Ser	Tyr	Gln	Glu	Leu	Met	Ser	Phe	Ser	Phe	Pro	Leu
Phe	Gly	Phe	Ser	Phe	Ala	Asp	Val	Pro	Val	Glu	Lys	Ala	Ala	Asn	Tyr
Ser	Cys	Glu	Asp	Ala	Asp	Ile	Thr	Tyr	Arg	Leu	Tyr	Lys	Thr	Leu	Ser
Leu	Lys	Leu	His	Glu	Ala	Asp	Leu	Glu	Asn	Val	Phe	Tyr	Lys	Ile	Glu
Met	Pro	Leu	Val	Asn	Val	Leu	Ala	Arg	Met	Glu	Leu	Asn	Gly	Val	Tyr
Val	Asp	Thr	Glu	Phe	Leu	Lys	Lys	Leu	Ser	Glu	Glu	Tyr	Gly	Lys	Lys
Leu	Glu	Glu	Leu	Ala	Glu	Glu	Ile	Tyr	Arg	Ile	Ala	Gly	Glu	Pro	Phe
Asn	Ile	Asn	Ser	Pro	Lys	Gln	Val	Ser	Arg	Ile	Leu	Phe	Glu	Lys	Leu
Gly	Ile	Lys	Pro	Arg	Gly	Lys	Thr	Thr	Lys	Thr	Gly	Asp	Tyr	Ser	Thr
Arg	Ile	Glu	Val	Leu	Glu	Glu	Leu	Ala	Gly	Glu	His	Glu	Ile	Ile	Pro
Leu	Ile	Leu	Glu	Tyr	Arg	Lys	Ile	Gln	Lys	Leu	Lys	Ser	Thr	Tyr	Ile
Asp	Ala	Leu	Pro	Lys	Met	Val	Asn	Pro	Lys	Thr	Gly	Arg	Ile	His	Ala
Ser	Phe	Asn	Gln	Thr	Gly	Thr	Ala	Thr	Gly	Arg	Leu	Ser	Ser	Ser	Asp
Pro	Asn	Leu	Gln	Asn	Leu	Pro	Thr	Lys	Ser	Glu	Glu	Gly	Lys	Glu	Ile
Arg	Lys	Ala	Ile	Val	Pro	Gln	Asp	Pro	Asn	Trp	Trp	Ile	Val	Ser	Ala
Asp	Tyr	Ser	Gln	Ile	Glu	Leu	Arg	Ile	Leu	Ala	His	Leu	Ser	Gly	Asp
Glu	Asn	Leu	Leu	Arg	Ala	Phe	Glu	Glu	Gly	Ile	Asp	Val	His	Thr	Leu
Thr	Ala	Ser	Arg	Ile	Phe	Asn	Val	Lys	Pro	Glu	Glu	Val	Thr	Glu	Glu
Met	Arg	Arg	Ala	Gly	Lys	Met	Val	Asn	Phe	Ser	Ile	Ile	Tyr	Gly	Val
Thr	Pro	Tyr	Gly	Leu	Ser	Val	Arg	Leu	Gly	Val	Pro	Val	Lys	Glu	Ala
Glu	Lys	Met	Ile	Val	Asn	Tyr	Phe	Val	Leu	Tyr	Pro	Lys	Val	Arg	Asp

Tyr	Ile	Gln	Arg	Val	Val	Ser	Glu	Ala	Lys	Glu	Lys	Gly	Tyr	Val	Arg
770						775					780				
Thr	Leu	Phe	Gly	Arg	Lys	Arg	Asp	Ile	Pro	Gln	Leu	Met	Ala	Arg	Asp
785					790					795					800
Arg	Asn	Thr	Gln	Ala	Glu	Gly	Glu	Arg	Ile	Ala	Ile	Asn	Thr	Pro	Ile
				805					810					815	
Gln	Gly	Thr	Ala	Ala	Asp	Ile	Ile	Lys	Leu	Ala	Met	Ile	Glu	Ile	Asp
			820					825					830		
Arg	Glu	Leu	Lys	Glu	Arg	Lys	Met	Arg	Ser	Lys	Met	Ile	Ile	Gln	Val
		835					840					845			
His	Asp	Glu	Leu	Val	Phe	Glu	Val	Pro	Asn	Glu	Glu	Lys	Asp	Ala	Leu
	850					855					860				
Val	Glu	Leu	Val	Lys	Asp	Arg	Met	Thr	Asn	Val	Val	Lys	Leu	Ser	Val
865					870					875					880
Pro	Leu	Glu	Val	Asp	Val	Thr	Ile	Gly	Lys	Thr	Trp	Ser			
				885					890						

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<211> 893

<212> PRT

<213> Thermotoga neopolitana

<220>

<223> Thermotoga neopolitana DNA polymerase (Tne)

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		20					25						30		
Asn	Ala	Val	Tyr	Gly	Val	Ala	Arg	Met	Leu	Val	Lys	Phe	Ile	Lys	Glu
		35					40					45			
His	Ile	Ile	Pro	Glu	Lys	Asp	Tyr	Ala	Ala	Val	Ala	Phe	Asp	Lys	Lys
	50					55					60				
Ala	Ala	Thr	Phe	Arg	His	Lys	Leu	Leu	Val	Ser	Asp	Lys	Ala	Gln	Arg
65					70					75					80
Pro	Lys	Thr	Pro	Ala	Leu	Leu	Val	Gln	Gln	Leu	Pro	Tyr	Ile	Lys	Arg
				85				90						95	
Leu	Ile	Glu	Ala	Leu	Gly	Phe	Lys	Val	Leu	Glu	Leu	Glu	Gly	Tyr	Glu
			100					105					110		
Ala	Asp	Asp	Ile	Ile	Ala	Thr	Leu	Ala	Val	Arg	Ala	Ala	Arg	Phe	Leu
		115					120					125			
Met	Arg	Phe	Ser	Leu	Ile	Thr	Gly	Asp	Lys	Asp	Met	Leu	Gln	Leu	Val
	130					135					140				
Asn	Glu	Lys	Ile	Lys	Val	Trp	Arg	Ile	Val	Lys	Gly	Ile	Ser	Asp	Leu
145					150					155					160
Glu	Leu	Tyr	Asp	Ser	Lys	Lys	Val	Lys	Glu	Arg	Tyr	Gly	Val	Glu	Pro
				165					170					175	
His	Gln	Ile	Pro	Asp	Leu	Leu	Ala	Leu	Thr	Gly	Asp	Asp	Ile	Asp	Asn
			180					185					190		
Ile	Pro	Gly	Val	Thr	Gly	Ile	Gly	Glu	Lys	Thr	Ala	Val	Gln	Leu	Leu
		195					200					205			
Gly	Lys	Tyr	Arg	Asn	Leu	Glu	Tyr	Ile	Leu	Glu	His	Ala	Arg	Glu	Leu
	210					215					220				
Pro	Gln	Arg	Val	Arg	Lys	Ala	Leu	Leu	Arg	Asp	Arg	Glu	Val	Ala	Ile
225					230					235					240
Leu	Ser	Lys	Lys	Leu	Ala	Thr	Leu	Val	Thr	Asn	Ala	Pro	Val	Glu	Val
				245					250					255	
Asp	Trp	Glu	Glu	Met	Lys	Tyr	Arg	Gly	Tyr	Asp	Lys	Arg	Lys	Leu	Leu
		260						265					270		
Pro	Ile	Leu	Lys	Glu	Leu	Glu	Phe	Ala	Ser	Ile	Met	Lys	Glu	Leu	Gln
		275					280					285			
Leu	Tyr	Glu	Glu	Ala	Glu	Pro	Thr	Gly	Tyr	Glu	Ile	Val	Lys	Asp	His
	290					295					300				
Lys	Thr	Phe	Glu	Asp	Leu	Ile	Glu	Lys	Leu	Lys	Glu	Val	Pro	Ser	Phe
305					310					315					320

Ala	Leu	Asp	Leu	Glu	Thr	Ser	Ser	Leu	Asp	Pro	Phe	Asn	Cys	Glu	Ile
				325					330					335	
Val	Gly	Ile	Ser	Val	Ser	Phe	Lys	Pro	Lys	Thr	Ala	Tyr	Tyr	Ile	Pro
			340					345					350		
Leu	His	His	Arg	Asn	Ala	His	Asn	Leu	Asp	Glu	Thr	Leu	Val	Leu	Ser
		355					360					365			
Lys	Leu	Lys	Glu	Ile	Leu	Glu	Asp	Pro	Ser	Ser	Lys	Ile	Val	Gly	Gln
	370					375					380				
Asn	Leu	Lys	Tyr	Asp	Tyr	Lys	Val	Leu	Met	Val	Lys	Gly	Ile	Ser	Pro
385					390					395					400
Val	Tyr	Pro	His	Phe	Asp	Thr	Met	Ile	Ala	Ala	Tyr	Leu	Leu	Glu	Pro
				405					410					415	
Asn	Glu	Lys	Lys	Phe	Asn	Leu	Glu	Asp	Leu	Ser	Leu	Lys	Phe	Leu	Gly
			420					425					430		
Tyr	Lys	Met	Thr	Ser	Tyr	Gln	Glu	Leu	Met	Ser	Phe	Ser	Ser	Pro	Leu
		435					440					445			
Phe	Gly	Phe	Ser	Phe	Ala	Asp	Val	Pro	Val	Asp	Lys	Ala	Ala	Glu	Tyr
	450					455					460				
Ser	Cys	Glu	Asp	Ala	Asp	Ile	Thr	Tyr	Arg	Leu	Tyr	Lys	Ile	Leu	Ser
465					470					475					480
Met	Lys	Leu	His	Glu	Ala	Glu	Leu	Glu	Asn	Val	Phe	Tyr	Arg	Ile	Glu
				485					490					495	
Met	Pro	Leu	Val	Asn	Val	Leu	Ala	Arg	Met	Glu	Phe	Asn	Trp	Val	Tyr
			500					505					510		
Val	Asp	Thr	Glu	Phe	Leu	Lys	Lys	Leu	Ser	Glu	Glu	Tyr	Gly	Lys	Lys
		515					520					525			
Leu	Glu	Glu	Leu	Ala	Glu	Lys	Ile	Tyr	Gln	Ile	Ala	Gly	Glu	Pro	Phe
	530					535					540				
Asn	Ile	Asn	Ser	Pro	Lys	Gln	Val	Ser	Asn	Ile	Leu	Phe	Glu	Lys	Leu
545					550					555					560
Gly	Ile	Lys	Pro	Arg	Gly	Lys	Thr	Thr	Lys	Thr	Gly	Asp	Tyr	Ser	Thr
				565					570					575	
Arg	Ile	Glu	Val	Leu	Glu	Glu	Ile	Ala	Asn	Glu	His	Glu	Ile	Val	Pro
			580					585					590		
Leu	Ile	Leu	Glu	Phe	Arg	Lys	Ile	Leu	Lys	Leu	Lys	Ser	Thr	Tyr	Ile
		595					600					605			
Asp	Thr	Leu	Pro	Lys	Leu	Val	Asn	Pro	Lys	Thr	Gly	Arg	Phe	His	Ala
	610					615					620				
Ser	Phe	His	Gln	Thr	Gly	Thr	Ala	Thr	Gly	Arg	Leu	Ser	Ser	Ser	Asp
625					630				635						640
Pro	Asn	Leu	Gln	Asn	Leu	Pro	Thr	Lys	Ser	Glu	Glu	Gly	Lys	Glu	Ile
				645					650					655	
Arg	Lys	Ala	Ile	Val	Pro	Gln	Asp	Pro	Asp	Trp	Trp	Ile	Val	Ser	Ala
			660					665					670		
Asp	Tyr	Ser	Gln	Ile	Glu	Leu	Arg	Ile	Leu	Ala	His	Leu	Ser	Gly	Asp
		675					680					685			
Glu	Asn	Leu	Val	Lys	Ala	Phe	Glu	Glu	Gly	Ile	Asp	Val	His	Thr	Leu
	690					695				700					
Thr	Ala	Ser	Arg	Ile	Tyr	Asn	Val	Lys	Pro	Glu	Glu	Val	Asn	Glu	Glu
705					710					715					720
Met	Arg	Arg	Val	Gly	Lys	Met	Val	Asn	Phe	Ser	Ile	Ile	Tyr	Gly	Val
				725					730					735	
Thr	Pro	Tyr	Gly	Leu	Ser	Val	Arg	Leu	Gly	Ile	Pro	Val	Lys	Glu	Ala
			740					745					750		
Glu	Lys	Met	Ile	Ile	Ser	Tyr	Phe	Thr	Leu	Tyr	Pro	Lys	Val	Arg	Ser
		755					760					765			
Tyr	Ile	Gln	Gln	Val	Val	Ala	Glu	Ala	Lys	Glu	Lys	Gly	Tyr	Val	Arg
	770					775					780				
Thr	Leu	Phe	Gly	Arg	Lys	Arg	Asp	Ile	Pro	Gln	Leu	Met	Ala	Arg	Asp
785					790					795					800
Lys	Asn	Thr	Gln	Ser	Glu	Gly	Glu	Arg	Ile	Ala	Ile	Asn	Thr	Pro	Ile
				805					810					815	
Gln	Gly	Thr	Ala	Ala	Asp	Ile	Ile	Lys	Leu	Ala	Met	Ile	Asp	Ile	Asp
			820					825					830		
Glu	Glu	Leu	Arg	Lys	Arg	Asn	Met	Lys	Ser	Arg	Met	Ile	Ile	Gln	Val
		835					840					845			

His Asp Glu Leu Val Phe Glu Val Pro Asp Glu Glu Lys Glu Glu Leu
850 855 860
Val Asp Leu Val Lys Asn Lys Met Thr Asn Val Val Lys Leu Ser Val
865 870 875 880
Pro Leu Glu Val Asp Ile Ser Ile Gly Lys Ser Trp Ser
885 890

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<211> 876
<212> PRT
<213> Bacillus stearothermophilus

<220>
<223> Bacillus stearothermophilus DNA polymerase (Bst)

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35 40 45
Glu Gln Pro Thr His Ile Leu Val Ala Phe Asp Ala Gly Lys Thr Thr
50 55 60
Phe Arg His Glu Thr Phe Gln Asp Tyr Lys Gly Gly Arg Gln Gln Thr
65 70 75 80
Pro Pro Glu Leu Ser Glu Gln Phe Pro Leu Arg Glu Leu Leu Lys
85 90 95
Ala Tyr Arg Ile Pro Ala Tyr Glu Leu Asp His Tyr Glu Ala Asp Asp
100 105 110
Ile Ile Gly Thr Met Ala Ala Arg Ala Glu Arg Glu Gly Phe Ala Val
115 120 125
Lys Val Ile Ser Gly Asp Arg Asp Leu Thr Gln Leu Ala Ser Pro Gln
130 135 140
Val Thr Val Glu Ile Thr Lys Lys Gly Ile Thr Asp Ile Glu Ser Tyr
145 150 155 160
Thr Pro Glu Thr Val Glu Lys Tyr Gly Leu Thr Pro Glu Gln Ile
165 170 175
Val Asp Leu Lys Gly Leu Met Gly Asp Lys Ser Asp Asn Ile Pro Gly
180 185 190
Val Pro Gly Ile Gly Glu Lys Thr Ala Val Lys Leu Leu Lys Gln Phe
195 200 205
Gly Thr Val Glu Asn Val Leu Ala Ser Ile Asp Glu Ile Lys Gly Glu
210 215 220
Lys Leu Lys Glu Asn Leu Arg Gln Tyr Arg Asp Leu Ala Leu Leu Ser
225 230 235 240
Lys Gln Leu Ala Ala Ile Cys Arg Asp Ala Pro Val Glu Leu Thr Leu
245 250 255
Asp Asp Ile Val Tyr Lys Gly Glu Asp Arg Glu Lys Val Val Ala Leu
260 265 270
Phe Gln Glu Leu Gly Phe Gln Ser Phe Leu Asp Lys Met Ala Val Gln
275 280 285
Thr Asp Glu Gly Glu Lys Pro Leu Ala Gly Met Asp Phe Ala Ile Ala
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Asp Ser Val Thr Asp Glu Met Leu Ala Asp Lys Ala Ala Leu Val Val
305 310 315 320
Glu Val Val Gly Asp Asn Tyr His His Ala Pro Ile Val Gly Ile Ala
325 330 335
Leu Ala Asn Glu Arg Gly Arg Phe Phe Leu Arg Pro Glu Thr Ala Leu
340 345 350
Ala Asp Pro Lys Phe Leu Ala Trp Leu Gly Asp Glu Thr Lys Lys Lys
355 360 365
Thr Met Phe Asp Ser Lys Arg Ala Ala Val Ala Leu Lys Trp Lys Gly
370 375 380
Ile Glu Leu Arg Gly Val Val Phe Asp Leu Leu Ala Ala Tyr Leu
385 390 395 400

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His	Gln	Tyr	Glu	Ala	Val	Arg	Ser	Asp	Glu	Ala	Val	Tyr	Gly	Lys	Gly
Ala	Lys	Arg	Thr	Val	Pro	Asp	Glu	Pro	Thr	Leu	Ala	Glu	His	Leu	Ala
Arg	Lys	Ala	Ala	Ala	Ile	Trp	Ala	Leu	Glu	Glu	Pro	Leu	Met	Asp	Glu
Leu	Arg	Arg	Asn	Glu	Gln	Asp	Arg	Leu	Leu	Thr	Glu	Leu	Glu	Gln	Pro
Leu	Ala	Gly	Ile	Leu	Ala	Asn	Met	Glu	Phe	Thr	Gly	Val	Lys	Val	Asp
Thr	Lys	Arg	Leu	Glu	Gln	Met	Gly	Ala	Glu	Leu	Thr	Glu	Gln	Leu	Gln
Ala	Val	Glu	Arg	Arg	Ile	Tyr	Glu	Leu	Ala	Gly	Gln	Glu	Phe	Asn	Ile
Asn	Ser	Pro	Lys	Gln	Leu	Gly	Thr	Val	Leu	Phe	Asp	Lys	Leu	Gln	Leu
Pro	Val	Leu	Lys	Lys	Thr	Lys	Thr	Gly	Tyr	Ser	Thr	Ser	Ala	Asp	Val
Leu	Glu	Lys	Leu	Ala	Pro	His	His	Glu	Ile	Val	Glu	His	Ile	Leu	His
Tyr	Arg	Gln	Leu	Gly	Lys	Leu	Gln	Ser	Thr	Tyr	Ile	Glu	Gly	Leu	Leu
Lys	Val	Val	His	Pro	Val	Thr	Gly	Lys	Val	His	Thr	Met	Phe	Asn	Gln
Ala	Leu	Thr	Gln	Thr	Gly	Arg	Leu	Ser	Ser	Val	Glu	Pro	Asn	Leu	Gln
Asn	Ile	Pro	Ile	Arg	Leu	Glu	Glu	Gly	Arg	Lys	Ile	Arg	Gln	Ala	Phe
Val	Pro	Ser	Glu	Pro	Asp	Trp	Leu	Ile	Phe	Ala	Ala	Asp	Tyr	Ser	Gln
Ile	Glu	Leu	Arg	Val	Leu	Ala	His	Ile	Ala	Glu	Asp	Asp	Asn	Leu	Ile
Glu	Ala	Phe	Arg	Arg	Gly	Leu	Asp	Ile	His	Thr	Lys	Thr	Ala	Met	Asp
Ile	Phe	His	Val	Ser	Glu	Glu	Asp	Val	Thr	Ala	Asn	Met	Arg	Arg	Gln
Ala	Lys	Ala	Val	Asn	Phe	Gly	Ile	Val	Tyr	Gly	Ile	Ser	Asp	Tyr	Gly
Leu	Ala	Gln	Asn	Leu	Asn	Ile	Thr	Arg	Lys	Glu	Ala	Ala	Glu	Phe	Ile
Glu	Arg	Tyr	Phe	Ala	Ser	Phe	Pro	Gly	Val	Lys	Gln	Tyr	Met	Asp	Asn
Ile	Val	Gln	Glu	Ala	Lys	Gln	Lys	Gly	Tyr	Val	Thr	Thr	Leu	Leu	His
Arg	Arg	Arg	Tyr	Leu	Pro	Asp	Ile	Thr	Ser	Arg	Asn	Phe	Asn	Val	Arg
Ser	Phe	Ala	Glu	Arg	Thr	Ala	Met	Asn	Thr	Pro	Ile	Gln	Gly	Ser	Ala
Ala	Asp	Ile	Ile	Lys	Lys	Ala	Met	Ile	Asp	Leu	Ser	Val	Arg	Leu	Arg
Glu	Glu	Arg	Leu	Gln	Ala	Arg	Leu	Leu	Gln	Val	His	Asp	Glu	Leu	Leu
Ile	Leu	Glu	Ala	Pro	Lys	Glu	Glu	Ile	Glu	Arg	Leu	Cys	Arg	Leu	Val
Pro	Glu	Val	Met	Glu	Gln	Ala	Val	Ala	Leu	Arg	Val	Pro	Leu	Lys	Val
Asp	Tyr	His	Tyr	Gly	Pro	Thr	Trp	Tyr	Asp	Ala	Lys				

<210> 37
 <211> 877
 <212> PRT
 <213> Bacillus caldotenax

<220>

<223> Bacillus caldodenax DNA polymerase (Bca)

<400> 37

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Ala	Phe	Phe	Ala	Leu	Pro	Leu	Leu	His	Asn	Asp	Lys	Gly	Ile	His	Thr
			20					25					30		
Asn	Ala	Val	Tyr	Gly	Phe	Thr	Met	Met	Leu	Asn	Lys	Ile	Leu	Ala	Glu
		35					40					45			
Glu	Glu	Pro	Thr	His	Met	Leu	Val	Ala	Phe	Asp	Ala	Gly	Lys	Thr	Thr
	50					55					60				
Phe	Arg	His	Glu	Ala	Phe	Gln	Glu	Tyr	Lys	Gly	Gly	Arg	Gln	Gln	Thr
65					70				75						80
Pro	Pro	Glu	Leu	Ser	Glu	Gln	Phe	Pro	Leu	Leu	Arg	Glu	Leu	Leu	Arg
				85					90					95	
Ala	Tyr	Arg	Ile	Pro	Ala	Tyr	Glu	Leu	Glu	Asn	Tyr	Glu	Ala	Asp	Asp
			100					105					110		
Ile	Ile	Gly	Thr	Leu	Ala	Ala	Arg	Ala	Glu	Gln	Glu	Gly	Phe	Glu	Val
		115					120					125			
Lys	Val	Ile	Ser	Gly	Asp	Arg	Asp	Leu	Thr	Gln	Leu	Ala	Ser	Pro	His
	130					135					140				
Val	Thr	Val	Asp	Ile	Thr	Lys	Lys	Gly	Ile	Thr	Asp	Ile	Glu	Pro	Tyr
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Thr	Pro	Glu	Ala	Val	Arg	Glu	Lys	Tyr	Gly	Leu	Thr	Pro	Glu	Gln	Ile
				165					170					175	
Val	Asp	Leu	Lys	Gly	Leu	Met	Gly	Asp	Lys	Ser	Asp	Asn	Ile	Pro	Gly
			180					185					190		
Val	Pro	Gly	Ile	Gly	Glu	Lys	Thr	Ala	Val	Lys	Leu	Leu	Arg	Gln	Phe
		195					200					205			
Gly	Thr	Val	Glu	Asn	Val	Leu	Ala	Ser	Ile	Asp	Glu	Ile	Lys	Gly	Glu
	210					215					220				
Lys	Leu	Lys	Glu	Thr	Leu	Arg	Gln	His	Arg	Glu	Met	Ala	Leu	Leu	Ser
225					230					235					240
Lys	Lys	Leu	Ala	Ala	Ile	Arg	Arg	Asp	Ala	Pro	Val	Glu	Leu	Ser	Leu
				245					250					255	
Asp	Asp	Ile	Ala	Tyr	Gln	Gly	Glu	Asp	Arg	Glu	Lys	Val	Val	Ala	Leu
			260					265					270		
Phe	Lys	Glu	Leu	Gly	Phe	Gln	Ser	Phe	Leu	Glu	Lys	Met	Glu	Ser	Pro
		275					280					285			
Ser	Ser	Glu	Glu	Glu	Lys	Pro	Leu	Ala	Lys	Met	Ala	Phe	Thr	Leu	Ala
	290					295					300				
Asp	Arg	Val	Thr	Glu	Glu	Met	Leu	Ala	Asp	Lys	Ala	Ala	Leu	Val	Val
305					310					315					320
Glu	Val	Val	Glu	Glu	Asn	Tyr	His	Asp	Ala	Pro	Ile	Val	Gly	Ile	Ala
				325					330					335	
Val	Val	Asn	Glu	His	Gly	Arg	Phe	Phe	Leu	Arg	Pro	Glu	Thr	Ala	Leu
			340					345					350		
Ala	Asp	Pro	Gln	Phe	Val	Ala	Trp	Leu	Gly	Asp	Glu	Thr	Lys	Lys	Lys
		355					360					365			
Ser	Met	Phe	Asp	Ser	Lys	Arg	Ala	Ala	Val	Ala	Leu	Lys	Trp	Lys	Gly
	370					375					380				
Ile	Glu	Leu	Cys	Gly	Val	Ser	Phe	Asp	Leu	Leu	Leu	Ala	Ala	Tyr	Leu
385					390					395					400
Leu	Asp	Pro	Ala	Gln	Gly	Val	Asp	Asp	Val	Ala	Ala	Ala	Ala	Lys	Met
				405					410					415	
Lys	Gln	Tyr	Glu	Ala	Val	Arg	Pro	Asp	Glu	Ala	Val	Tyr	Gly	Lys	Gly
			420					425					430		
Ala	Lys	Arg	Ala	Val	Pro	Asp	Glu	Pro	Val	Leu	Ala	Glu	His	Leu	Val
		435					440					445			
Arg	Lys	Ala	Ala	Ala	Ile	Trp	Ala	Leu	Glu	Arg	Pro	Phe	Leu	Asp	Glu
	450					455					460				
Leu	Arg	Arg	Asn	Glu	Gln	Asp	Arg	Leu	Leu	Val	Glu	Leu	Glu	Gln	Pro
465					470					475					480
Leu	Ser	Ser	Ile	Leu	Ala	Glu	Met	Glu	Phe	Ala	Gly	Val	Lys	Val	Asp
				485					490					495	

Thr	Lys	Arg	Leu	Glu	Gln	Met	Gly	Glu	Glu	Leu	Ala	Glu	Gln	Leu	Arg
			500					505					510		
Thr	Val	Glu	Gln	Arg	Ile	Tyr	Glu	Leu	Ala	Gly	Gln	Glu	Phe	Asn	Ile
		515					520					525			
Asn	Ser	Pro	Lys	Gln	Leu	Gly	Val	Ile	Leu	Phe	Glu	Lys	Leu	Gln	Leu
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Leu	Glu	Lys	Leu	Ala	Pro	Tyr	His	Glu	Ile	Val	Glu	Asn	Ile	Leu	Gln
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His	Tyr	Arg	Gln	Leu	Gly	Lys	Leu	Gln	Ser	Thr	Tyr	Ile	Glu	Gly	Leu
			580					585					590		
Leu	Lys	Val	Val	Arg	Pro	Asp	Thr	Lys	Lys	Val	His	Thr	Ile	Phe	Asn
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Gln	Ala	Leu	Thr	Gln	Thr	Gly	Arg	Leu	Ser	Ser	Thr	Glu	Pro	Asn	Leu
	610					615					620				
Gln	Asn	Ile	Pro	Ile	Arg	Leu	Glu	Glu	Gly	Arg	Lys	Ile	Arg	Gln	Ala
625					630					635					640
Phe	Val	Pro	Ser	Glu	Ser	Asp	Trp	Leu	Ile	Phe	Ala	Ala	Asp	Tyr	Ser
				645					650					655	
Gln	Ile	Glu	Leu	Arg	Val	Leu	Ala	His	Ile	Ala	Glu	Asp	Asp	Asn	Leu
			660					665					670		
Met	Glu	Ala	Phe	Arg	Arg	Asp	Leu	Asp	Ile	His	Thr	Lys	Thr	Ala	Met
		675					680					685			
Asp	Ile	Phe	Gln	Val	Ser	Glu	Asp	Glu	Val	Thr	Pro	Asn	Met	Arg	Arg
	690					695					700				
Gln	Ala	Lys	Ala	Val	Asn	Phe	Gly	Ile	Val	Tyr	Gly	Ile	Ser	Asp	Tyr
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Gly	Leu	Ala	Gln	Asn	Leu	Asn	Ile	Ser	Arg	Lys	Glu	Ala	Ala	Glu	Phe
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Ile	Glu	Arg	Tyr	Phe	Glu	Ser	Phe	Pro	Gly	Val	Lys	Arg	Tyr	Met	Glu
			740					745					750		
Asn	Ile	Val	Gln	Glu	Ala	Lys	Gln	Lys	Gly	Tyr	Val	Thr	Thr	Leu	Leu
		755					760					765			
His	Arg	Arg	Arg	Tyr	Leu	Pro	Asp	Ile	Thr	Ser	Arg	Asn	Phe	Asn	Val
	770					775					780				
Arg	Ser	Phe	Ala	Glu	Arg	Met	Ala	Met	Asn	Thr	Pro	Ile	Gln	Gly	Ser
785					790					795					800
Ala	Ala	Asp	Ile	Ile	Lys	Lys	Ala	Met	Ile	Asp	Leu	Asn	Ala	Arg	Leu
				805					810					815	
Lys	Glu	Glu	Arg	Leu	Gln	Ala	Arg	Leu	Leu	Leu	Gln	Val	His	Asp	Glu
			820					825					830		
Leu	Ile	Leu	Glu	Ala	Pro	Lys	Glu	Glu	Met	Glu	Arg	Leu	Cys	Arg	Leu
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Val	Pro	Glu	Val	Met	Glu	Gln	Ala	Val	Thr	Leu	Arg	Val	Pro	Leu	Lys
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Val	Asp	Tyr	His	Tyr	Gly	Ser	Thr	Trp	Tyr	Asp	Ala	Lys			
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<210> 38

<211> 13

<212> PRT

<213> Artificial Sequence

<220>

<223> synthetic polymerase motif corresponding to the D580X mutation of Z05

<220>

<221> VARIANT

<222> (7)...(7)

<223> Xaa = Ser or Thr

<220>

<221> VARIANT

<222> (8)...(8)

<223> Xaa = any amino acid other than Asp or Glu

<400> 38

Thr Gly Arg Leu Ser Ser Xaa Xaa Pro Asn Leu Gln Asn
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<210> 39

<211> 1491

<212> DNA

<213> Artificial Sequence

<220>

<223> synthetic amplicon encoding polymerase domain of Z05
D580G DNA polymerase amplified by error-prone (mutagenic)
PCR between B1PI and BglII restriction sites

<400> 39

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<210> 40

<211> 831

<212> PRT

<213> Carboxydotherrnus hydrogenoformans

<220>

<223> Carboxydotherrnus hydrogenoformans DNA polymerase (Chy)

<400> 40

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20 25 30
Ala Val Tyr Glu Phe Leu Thr Met Leu Phe Arg Val Ile Lys Asp Glu
35 40 45
Lys Pro Glu Tyr Leu Ala Val Ala Phe Asp Ile Ser Arg Lys Thr Phe
50 55 60
Arg Thr Glu Gln Phe Thr Ala Tyr Lys Gly His Arg Lys Glu Ala Pro
65 70 75 80
Asp Glu Leu Val Pro Gln Phe Ala Leu Val Arg Glu Val Leu Lys Val
85 90 95
Leu Asn Val Pro Tyr Ile Glu Leu Asp Gly Tyr Glu Ala Asp Asp Ile
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Ile	Gly	His	100	Leu	Ser	Arg	Ala	Phe	105	Ala	Gly	Gln	Gly	His	110	Glu	Val	Val
Ile	Tyr	Thr	115	Ala	Asp	Arg	Asp	Met	120	Leu	Gln	Leu	Val	Asp	125	Glu	Lys	Thr
Val	Val	Tyr	130	Leu	Thr	Lys	Lys	Gly	135	Ile	Thr	Glu	Leu	Val	140	Lys	Met	Asp
Leu	Ala	Ala	145	Ile	Leu	Glu	Asn	Tyr	150	Gly	Leu	Lys	Pro	Lys	155	Gln	Leu	Val
Asp	Val	Lys	165	Gly	Leu	Met	Gly	Asp	170	Pro	Ser	Asp	Asn	Ile	175	Pro	Gly	Val
Pro	Gly	Ile	180	Gly	Glu	Lys	Thr	Ala	185	Leu	Asp	Leu	Ile	Lys	190	Thr	Tyr	Gly
Ser	Val	Glu	195	Glu	Val	Leu	Ala	Arg	200	Lys	Asp	Glu	Leu	Lys	205	Pro	Lys	Leu
Arg	Glu	Lys	210	Leu	Ala	Glu	His	Glu	215	Asn	Leu	Ala	Lys	Ile	220	Ser	Lys	Gln
Leu	Ala	Thr	225	Ile	Leu	Arg	Glu	Ile	230	Pro	Leu	Glu	Ile	Ser	235	Leu	Glu	Asp
Leu	Lys	Val	245	Lys	Glu	Pro	Asn	Tyr	250	Glu	Glu	Val	Ala	Lys	255	Leu	Phe	Leu
His	Leu	Glu	260	Phe	Lys	Ser	Phe	Leu	265	Lys	Glu	Ile	Glu	Pro	270	Lys	Ile	Lys
Lys	Glu	Tyr	275	Gln	Glu	Gly	Lys	Asp	280	Leu	Val	Gln	Val	Glu	285	Thr	Val	Glu
Thr	Glu	Gly	290	Gln	Ile	Ala	Val	Val	295	Phe	Ser	Asp	Gly	Phe	300	Tyr	Val	Asp
Asp	Gly	Glu	305	Lys	Thr	Lys	Phe	Tyr	310	Ser	Leu	Asp	Arg	Leu	315	Asn	Glu	Ile
Glu	Glu	Ile	325	Phe	Arg	Asn	Lys	Lys	330	Ile	Ile	Thr	Asp	Asp	335	Ala	Lys	Gly
Ile	Tyr	His	340	Val	Cys	Leu	Glu	Lys	345	Leu	Thr	Phe	Pro	350	Glu	Val	Cys	
Phe	Asp	Ala	355	Arg	Ile	Ala	Ala	Tyr	360	Val	Leu	Asn	Pro	365	Ala	Asp	Gln	Asn
Pro	Gly	Leu	370	Lys	Gly	Leu	Tyr	Leu	375	Lys	Tyr	Asp	Leu	380	Pro	Val	Tyr	Glu
Asp	Val	Ser	385	Leu	Asn	Ile	Arg	Gly	390	Leu	Phe	Tyr	Leu	395	Lys	Lys	Glu	Met
Met	Arg	Lys	405	Ile	Phe	Glu	Gln	Glu	410	Gln	Glu	Arg	Leu	415	Phe	Tyr	Glu	Ile
Glu	Leu	Pro	420	Leu	Thr	Pro	Val	Leu	425	Ala	Gln	Met	Glu	430	His	Thr	Gly	Ile
Gln	Val	Asp	435	Arg	Glu	Ala	Leu	Lys	440	Glu	Met	Ser	Leu	445	Glu	Leu	Gly	Glu
Gln	Ile	Glu	450	Glu	Leu	Ile	Arg	Glu	455	Ile	Tyr	Val	Leu	460	Ala	Gly	Glu	Glu
Phe	Asn	Leu	465	Asn	Ser	Pro	Arg	Gln	470	Leu	Gly	Val	Ile	475	Leu	Phe	Glu	Lys
Leu	Gly	Leu	485	Val	Ile	Lys	Lys	Thr	490	Lys	Thr	Gly	Tyr	495	Ser	Thr	Asp	
Ala	Glu	Val	500	Leu	Glu	Glu	Leu	Leu	505	Pro	Phe	His	Glu	510	Ile	Ile	Gly	Lys
Ile	Leu	Asn	515	Tyr	Arg	Gln	Leu	Met	520	Lys	Leu	Lys	Ser	525	Thr	Tyr	Thr	Asp
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Phe	Asn	Gln	545	Thr	Gly	Thr	Leu	Thr	550	Gly	Arg	Leu	Ala	555	Ser	Ser	Glu	Pro
Asn	Leu	Gln	565	Asn	Ile	Pro	Ile	Arg	570	Leu	Glu	Gly	Arg	575	Lys	Leu	Arg	
Lys	Met	Phe	580	Ile	Pro	Ser	Pro	Gly	585	Tyr	Asp	Tyr	Ile	590	Val	Ser	Ala	Asp
Tyr	Ser	Gln	595	Ile	Glu	Leu	Arg	Leu	600	Leu	Ala	His	Phe	605	Ser	Glu	Glu	Pro
Lys	Leu	Ile	610	Glu	Ala	Tyr	Gln	Lys	615	Gly	Glu	Asp	Ile	620	His	Arg	Lys	Thr
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				645					650					655	
Arg	Ala	His	Ala	Lys	Ser	Val	Asn	Phe	Gly	Ile	Val	Tyr	Gly	Ile	Ser
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Asp	Phe	Gly	Leu	Gly	Arg	Asp	Leu	Lys	Ile	Pro	Arg	Glu	Val	Ala	Gly
		675					680					685			
Lys	Tyr	Ile	Lys	Asn	Tyr	Phe	Ala	Asn	Tyr	Pro	Lys	Val	Arg	Glu	Tyr
	690					695					700				
Leu	Asp	Glu	Leu	Val	Arg	Thr	Ala	Arg	Glu	Lys	Gly	Tyr	Val	Thr	Thr
705					710					715					720
Leu	Phe	Gly	Arg	Arg	Arg	Tyr	Ile	Pro	Glu	Leu	Ser	Ser	Lys	Asn	Arg
				725					730					735	
Thr	Val	Gln	Gly	Phe	Gly	Glu	Arg	Thr	Ala	Met	Asn	Thr	Pro	Leu	Gln
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Gly	Ser	Ala	Ala	Asp	Ile	Ile	Lys	Leu	Ala	Met	Ile	Asn	Val	Glu	Lys
		755					760					765			
Glu	Leu	Lys	Ala	Arg	Lys	Leu	Lys	Ser	Arg	Leu	Leu	Leu	Ser	Val	His
	770					775					780				
Asp	Glu	Leu	Val	Leu	Glu	Val	Pro	Ala	Glu	Glu	Leu	Glu	Glu	Val	Lys
785					790					795					800
Ala	Leu	Val	Lys	Gly	Val	Met	Glu	Ser	Val	Val	Glu	Leu	Lys	Val	Pro
				805					810					815	
Leu	Ile	Ala	Glu	Val	Gly	Ala	Gly	Lys	Asn	Trp	Tyr	Glu	Ala	Lys	
			820					825					830		