

Alignment of fungal lipolytic enzymes

	1	43
lip_rhimi	AAT SQEINELTYT TLSANSYCR TVIPG..... ATWDCIHCDA	
lip_rhid1	SASDGGKVVAAT TAQIQEFKY AGIAATAYCR SVVPG..... NKWDCVQCQK	
FoLNP11	GVT TTDFSNFKFY IQHGAAAYC. .NSEAAAGSK ITCSNNGCPT	
pcmdgl	DVS TSELDQFEFW VQYAAASYE ADYTAQVGDK LSCSKGNCPE	
SP400	EVS QDLFNQFNLF AQYSAAAYCG KNNDAPAGTN ITCTGNACPE	
T_ibad	AVP QDLLDQFELF SQYSAAAYCA ANNHAPVGSD VTCSENVCP	
acid		
alcohol	-	
	44	93
lip_rhimi	TE..DLKIIK TWST.LIYDT NAMVARGDSE KTIYIVFRGS SSIRNWIADL	
lip_rhid1	WV..PDGKII TTFTSLLSDT NGYVLRSDKQ KTIYLVFRGT NSFRSAITDI	
FoLNP11	VQNGGATIVT SFVGSK.TGI GGYVATDSAR KEIVVSFRGS INIRNWLTLN	
pcmdgl	VEATGATVSY DFSDSTITDT AGYIAVDHTN SAVVLAFRGS YSVRNWVADA	
SP400	VEKADATFLY SFEDSGVGDV TGFLALDNTN KLIVLSFRGS RSIENWIGNL	
T_ibad	VDAADATFLY SFEDSGLGDV TGLLALDNTN KLIVLSFRGS RSVENWIANL	
acid		----
alcohol		-- --- -
	94	143
lip_rhimi	TFVPVSYP.P VSGTKVHKGFLDSYGEVQNE LVATVLDQFK QYPSYKVAVT	
lip_rhid1	VFNFSDYK.P VKGAKVHAGF LSSYEQVVND YFPVVQEQLT AHPTYKVIIVT	
FoLNP11	DFGQEDCS.L VSGCGVHSGF QRAWNEISSQ ATAASARK ANPSFNVIST	

Figure 1

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pcmdgl  TFVHTNPG.L CDGCLAELGF WSSWKLVRDD IIKELKEVVA QNPNYELVVV

      SP400  NFDLKEINDI CSGCRGHDGF TSSWRSVADT LRQKVEDAVR EHPDYRVVFT
      T__ibad AADLTGISDI CSGCEGHVGF VTSWRSVADT IREQVQNAVN EHPDYRVVFT
acid      ----
alcohol

      144                                     189

lip_rhimi  GHSLGGATAL LCALDLYQRE EGLSSSNLFL YTQGGPRVGD PAFANYVVST
lip_rhidl  GHSLGGAQAL LAGMDLYQRE PRLSPKNLSI FTVGGPRVGN PTFAYYVEST
FoLNP11    GHSLGGAVAV LAAANLRVGG T.....PVDI YTYGSPRVGN AQLSAFVSNQ
pcmdgl     GHSLGAAVAT LAATDLRGKG YP.....SAKL YAYASPRVGN AALAKYITAQ
      SP400  GHSLGGALAT VAGADLRGNG Y.....DIDV FSYGAPRVGN RAFAEFLTVQ
      T__ibad GHSLGGALAT IAAAALRGNG Y.....NIDV FSYGAPRVGN RAFAEFLTAQ
acid      ---
alcohol    -

      190                                     237

lip_rhimi  .GIPYRRTVN ERDIVPHLPP AAFGFLHAGE EYWITD.... ...NSPETVQ
lip_rhidl  .GIPFQRTVH KRDIVPHVPP QSFGLHPGV ESWIKS.... ....GTSNVQ
FoLNP11    .AGGEYRVTH ADDPVPRLPP LIFGYRHTTP EFWLSGGGGD KVDYTISDVK
pcmdgl     ..GNNFRFTH TNDPVPKLPL LSMGYVHVSP EYWITS..PN NATVSTSDIK
      SP400  TGGTLYRITH TNDIVPRLPP REFGYSHSSP EYWIKS..GT LVPVTRNDIV
      T__ibad TGGTLYRITH TNDIVPRLPP RDWGYSHSSP EYWVTS..GN DVPVTANDIT
acid      --  --
alcohol    -

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Figure 1 continued

	238		269
lip_rhimi	VCTSDLETSD CSNSIVPFT.	.SVLDHLSYF	GINTGLCT
lip_rhid1	ICTSEIETKD CSNSIVPFT.	.SILDHLSYF	DINEGSCL
FoLNP11	VCEGAANLG. CNGGTLGL..	.DIAAHLHYF	.QATDACNAG GFS
pcmdgl	VIDGDVSFD. GNTGTGLPLL	TDFEAHIWYF	.VQVDAGKGP GLPFKRV
SP400	KIEGIDATG. GNNQPNIP..	.DIPAHLWYF	.GLIGTCL
T_ibad	VVEGIDSTD. GNNQGNTF..	.DIPSHLWYF	.GPISECD
acid		- -	--
alcohol			

12 SQ listing.ST25 15-MAY-2006
SEQUENCE LISTING

<110> Novozymes A/S
<120> Enzymatic Enantioselective Ester or Amide Hydrolysis or Synthesis
<130> 10760-204.WO
<160> 7
<170> PatentIn version 3.3
<210> 1
<211> 269
<212> PRT
<213> Rhizomucor miehei

<400> 1

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Leu Thr Tyr Tyr Thr Thr Leu Ser Ala Asn Ser Tyr Cys Arg Thr Val
20 25 30

Ile Pro Gly Ala Thr Trp Asp Cys Ile His Cys Asp Ala Thr Glu Asp
35 40 45

Leu Lys Ile Ile Lys Thr Trp Ser Thr Leu Ile Tyr Asp Thr Asn Ala
50 55 60

Met Val Ala Arg Gly Asp Ser Glu Lys Thr Ile Tyr Ile Val Phe Arg
65 70 75 80

Gly Ser Ser Ser Ile Arg Asn Trp Ile Ala Asp Leu Thr Phe Val Pro
85 90 95

Val Ser Tyr Pro Pro Val Ser Gly Thr Lys Val His Lys Gly Phe Leu
100 105 110

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

Gln Phe Lys Gln Tyr Pro Ser Tyr Lys Val Ala Val Thr Gly His Ser
130 135 140

Leu Gly Gly Ala Thr Ala Leu Leu Cys Ala Leu Asp Leu Tyr Gln Arg
145 150 155 160

Glu Glu Gly Leu Ser Ser Ser Asn Leu Phe Leu Tyr Thr Gln Gly Gln
165 170 175

Pro Arg Val Gly Asp Pro Ala Phe Ala Asn Tyr Val Val Ser Thr Gly
180 185 190

Ile Pro Tyr Arg Arg Thr Val Asn Glu Arg Asp Ile Val Pro His Leu
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12 SQ listing.ST25 15-MAY-2006
200 205

Pro Pro Ala Ala Phe Gly Phe Leu His Ala Gly Glu Glu Tyr Trp Ile
210 215 220

Thr Asp Asn Ser Pro Glu Thr Val Gln Val Cys Thr Ser Asp Leu Glu
225 230 235 240

Thr Ser Asp Cys Ser Asn Ser Ile Val Pro Phe Thr Ser Val Leu Asp
245 250 255

His Leu Ser Tyr Phe Gly Ile Asn Thr Gly Leu Cys Thr
260 265

<210> 2

<211> 538

<212> PRT

<213> Rhizopus delemar

<400> 2

Ser Asp Gly Gly Lys Val Val Ala Ala Thr Thr Ala Gln Ile Gln Glu
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20 25 30

Val Pro Gly Asn Lys Trp Asp Cys Val Gln Cys Gln Lys Trp Val Pro
35 40 45

Asp Gly Lys Ile Ile Thr Thr Phe Thr Ser Leu Leu Ser Asp Thr Asn
50 55 60

Gly Tyr Val Leu Arg Ser Asp Lys Gln Lys Thr Ile Tyr Leu Val Phe
65 70 75 80

Arg Gly Thr Asn Ser Phe Arg Ser Ala Ile Thr Asp Ile Val Phe Asn
85 90 95

Phe Ser Asp Tyr Lys Pro Val Lys Gly Ala Lys Val His Ala Gly Phe
100 105 110

Leu Ser Ser Tyr Glu Gln Val Val Asn Asp Tyr Phe Pro Val Val Gln
115 120 125

Glu Gln Leu Thr Ala His Pro Thr Tyr Lys Val Ile Val Thr Gly His
130 135 140

Ser Leu Gly Gly Ala Gln Ala Leu Leu Ala Gly Met Asp Leu Tyr Gln
145 150 155 160

Arg Glu Pro Arg Leu Ser Pro Lys Asn Leu Ser Ile Phe Thr Val Gly
165 170 175

12 SQ listing.ST25 15-MAY-2006

Gly Pro Arg Val Gly Asn Pro Thr Phe Ala Tyr Tyr Val Glu Ser Thr
180 185 190

Gly Ile Pro Phe Gln Arg Thr Val His Lys Arg Asp Ile Val Pro His
195 200 205

Val Pro Pro Gln Ser Phe Gly Phe Leu His Pro Gly Val Glu Ser Trp
210 215 220

Ile Lys Ser Gly Thr Ser Asn Val Gln Ile Cys Thr Ser Glu Ile Glu
225 230 235 240

Thr Lys Asp Cys Ser Asn Ser Ile Val Pro Phe Thr Ser Ile Leu Asp
245 250 255

His Leu Ser Tyr Phe Asp Ile Asn Glu Gly Ser Cys Leu Ser Asp Gly
260 265 270

Gly Lys Val Val Ala Ala Thr Thr Ala Gln Ile Gln Glu Phe Thr Lys
275 280 285

Tyr Ala Gly Ile Ala Ala Thr Ala Tyr Cys Arg Ser Val Val Pro Gly
290 295 300

Asn Lys Trp Asp Cys Val Gln Cys Gln Lys Trp Val Pro Asp Gly Lys
305 310 315 320

Ile Ile Thr Thr Phe Thr Ser Leu Leu Ser Asp Thr Asn Gly Tyr Val
325 330 335

Leu Arg Ser Asp Lys Gln Lys Thr Ile Tyr Leu Val Phe Arg Gly Thr
340 345 350

Asn Ser Phe Arg Ser Ala Ile Thr Asp Ile Val Phe Asn Phe Ser Asp
355 360 365

Tyr Lys Pro Val Lys Gly Ala Lys Val His Ala Gly Phe Leu Ser Ser
370 375 380

Tyr Glu Gln Val Val Asn Asp Tyr Phe Pro Val Val Gln Glu Gln Leu
385 390 395 400

Thr Ala His Pro Thr Tyr Lys Val Ile Val Thr Gly His Ser Leu Gly
405 410 415

Gly Ala Gln Ala Leu Leu Ala Gly Met Asp Leu Tyr Gln Arg Glu Pro
420 425 430

Arg Leu Ser Pro Lys Asn Leu Ser Ile Phe Thr Val Gly Gly Pro Arg
435 440 445

12 SQ listing.ST25 15-MAY-2006

Val Gly Asn Pro Thr Phe Ala Tyr Tyr Val Glu Ser Thr Gly Ile Pro
450 455 460

Phe Gln Arg Thr Val His Lys Arg Asp Ile Val Pro His Val Pro Pro
465 470 475 480

Gln Ser Phe Gly Phe Leu His Pro Gly Val Glu Ser Trp Ile Lys Ser
485 490 495

Gly Thr Ser Asn Val Gln Ile Cys Thr Ser Glu Ile Glu Thr Lys Asp
500 505 510

Cys Ser Asn Ser Ile Val Pro Phe Thr Ser Ile Leu Asp His Leu Ser
515 520 525

Tyr Phe Asp Ile Asn Glu Gly Ser Cys Leu
530 535

<210> 3
<211> 286
<212> PRT
<213> Fusarium oxysporum

<400> 3

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Gln His Gly Ala Ala Ala Tyr Cys Asn Ser Glu Ala Ala Ala Gly Ser
20 25 30

Lys Ile Thr Cys Ser Asn Asn Gly Cys Pro Thr Val Gln Gly Asn Gly
35 40 45

Ala Thr Ile Val Thr Ser Phe Val Gly Ser Lys Thr Gly Ile Gly Gly
50 55 60

Tyr Val Ala Thr Asp Ser Ala Arg Lys Glu Ile Val Val Ser Phe Arg
65 70 75 80

Gly Ser Ile Asn Ile Arg Asn Trp Leu Thr Asn Leu Asp Phe Gly Gln
85 90 95

Glu Asp Cys Ser Leu Val Ser Gly Cys Gly Val His Ser Gly Phe Gln
100 105 110

Arg Ala Trp Asn Glu Ile Ser Ser Gln Ala Thr Ala Ala Val Ala Ser
115 120 125

Ala Arg Lys Ala Asn Pro Ser Phe Asn Val Ile Ser Thr Gly His Ser
130 135 140

12 SQ listing.ST25 15-MAY-2006

Leu Gly Gly Ala Val Ala Val Leu Ala Ala Ala Asn Leu Arg Val Gly
145 150 155 160

Gly Thr Pro Val Asp Ile Tyr Thr Tyr Gly Ser Pro Arg Val Gly Asn
165 170 175

Ala Gln Leu Ser Ala Phe Val Ser Asn Gln Ala Gly Gly Glu Tyr Arg
180 185 190

Val Thr His Ala Asp Asp Pro Val Pro Arg Leu Pro Pro Leu Ile Phe
195 200 205

Gly Tyr Arg His Thr Thr Pro Glu Phe Trp Leu Ser Gly Gly Gly Gly
210 215 220

Asp Lys Val Asp Tyr Thr Ile Ser Asp Val Lys Val Cys Glu Gly Ala
225 230 235 240

Ala Asn Leu Gly Cys Asn Gly Gly Thr Leu Gly Leu Asp Ile Ala Ala
245 250 255

His Leu His Tyr Phe Gln Ala Thr Asp Ala Cys Asn Ala Gly Gly Phe
260 265 270

Ser Trp Arg Arg Tyr Arg Ser Ala Glu Ser Val Asp Lys Arg
275 280 285

<210> 4
<211> 278
<212> PRT
<213> Penicillium camemberti

<400> 4

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1 5 10 15

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20 25 30

Lys Leu Ser Cys Ser Lys Gly Asn Cys Pro Glu Val Glu Ala Thr Gly
35 40 45

Ala Thr Val Ser Tyr Asp Phe Ser Asp Ser Thr Ile Thr Asp Thr Ala
50 55 60

Gly Tyr Ile Ala Val Asp His Thr Asn Ser Ala Val Val Leu Ala Phe
65 70 75 80

Arg Gly Ser Tyr Ser Val Arg Asn Trp Val Ala Asp Ala Thr Phe Val
85 90 95

His Thr Asn Pro Gly Leu Cys Asp Gly Cys Leu Ala Glu Leu Gly Phe
 100 105 110

Trp Ser Ser Trp Lys Leu Val Arg Asp Asp Ile Ile Lys Glu Leu Lys
 115 120 125

Glu Val Val Ala Gln Asn Pro Asn Tyr Glu Leu Val Val Val Gly His
 130 135 140

Ser Leu Gly Ala Ala Val Ala Thr Leu Ala Ala Thr Asp Leu Arg Gly
 145 150 155 160

Lys Gly Tyr Pro Ser Ala Lys Leu Tyr Ala Tyr Ala Ser Pro Arg Val
 165 170 175

Gly Asn Ala Ala Leu Ala Lys Tyr Ile Thr Ala Gln Gly Asn Asn Phe
 180 185 190

Arg Phe Thr His Thr Asn Asp Pro Val Pro Lys Leu Pro Leu Leu Ser
 195 200 205

Met Gly Tyr Val His Val Ser Pro Glu Tyr Trp Ile Thr Ser Pro Asn
 210 215 220

Asn Ala Thr Val Ser Thr Ser Asp Ile Lys Val Ile Asp Gly Asp Val
 225 230 235 240

Ser Phe Asp Gly Asn Thr Gly Thr Gly Leu Pro Leu Leu Thr Asp Phe
 245 250 255

Glu Ala His Ile Trp Tyr Phe Val Gln Val Asp Ala Gly Lys Gly Pro
 260 265 270

Gly Leu Pro Phe Lys Arg
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<210> 5
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 <212> PRT
 <213> Thermomyces lanuginosus

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 1 5 10 15

Ser Ala Ala Ala Tyr Cys Gly Lys Asn Asn Asp Ala Pro Ala Gly Thr
 20 25 30

Asn Ile Thr Cys Thr Gly Asn Ala Cys Pro Glu Val Glu Lys Ala Asp
 35 40 45

Ala Thr Phe Leu Tyr Ser Phe Glu Asp Ser Gly Val Gly Asp Val Thr
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12 SQ listing.ST25 15-MAY-2006
55 60

Gly Phe Leu Ala Leu Asp Asn Thr Asn Lys Leu Ile Val Leu Ser Phe
65 70 75 80

Arg Gly Ser Arg Ser Ile Glu Asn Trp Ile Gly Asn Leu Asn Phe Asp
85 90 95

Leu Lys Glu Ile Asn Asp Ile Cys Ser Gly Cys Arg Gly His Asp Gly
100 105 110

Phe Thr Ser Ser Trp Arg Ser Val Ala Asp Thr Leu Arg Gln Lys Val
115 120 125

Glu Asp Ala Val Arg Glu His Pro Asp Tyr Arg Val Val Phe Thr Gly
130 135 140

His Ser Leu Gly Gly Ala Leu Ala Thr Val Ala Gly Ala Asp Leu Arg
145 150 155 160

Gly Asn Gly Tyr Asp Ile Asp Val Phe Ser Tyr Gly Ala Pro Arg Val
165 170 175

Gly Asn Arg Ala Phe Ala Glu Phe Leu Thr Val Gln Thr Gly Gly Thr
180 185 190

Leu Tyr Arg Ile Thr His Thr Asn Asp Ile Val Pro Arg Leu Pro Pro
195 200 205

Arg Glu Phe Gly Tyr Ser His Ser Ser Pro Glu Tyr Trp Ile Lys Ser
210 215 220

Gly Thr Leu Val Pro Val Thr Arg Asn Asp Ile Val Lys Ile Glu Gly
225 230 235 240

Ile Asp Ala Thr Gly Gly Asn Asn Gln Pro Asn Ile Pro Asp Ile Pro
245 250 255

Ala His Leu Trp Tyr Phe Gly Leu Ile Gly Thr Cys Leu
260 265

<210> 6

<211> 269

<212> PRT

<213> Thermomyces ibadanensis

<400> 6

Ala Val Pro Gln Asp Leu Leu Asp Gln Phe Glu Leu Phe Ser Gln Tyr
1 5 10 15

Ser Ala Ala Ala Tyr Cys Ala Ala Asn Asn His Ala Pro Val Gly Ser
20 25 30

12 SQ listing.ST25 15-MAY-2006

Asp Val Thr Cys Ser Glu Asn Val Cys Pro Glu Val Asp Ala Ala Asp
35 40 45

Ala Thr Phe Leu Tyr Ser Phe Glu Asp Ser Gly Leu Gly Asp Val Thr
50 55 60

Gly Leu Leu Ala Leu Asp Asn Thr Asn Lys Leu Ile Val Leu Ser Phe
65 70 75 80

Arg Gly Ser Arg Ser Val Glu Asn Trp Ile Ala Asn Leu Ala Ala Asp
85 90 95

Leu Thr Glu Ile Ser Asp Ile Cys Ser Gly Cys Glu Gly His Val Gly
100 105 110

Phe Val Thr Ser Trp Arg Ser Val Ala Asp Thr Ile Arg Glu Gln Val
115 120 125

Gln Asn Ala Val Asn Glu His Pro Asp Tyr Arg Val Val Phe Thr Gly
130 135 140

His Ser Leu Gly Gly Ala Leu Ala Thr Ile Ala Ala Ala Ala Leu Arg
145 150 155 160

Gly Asn Gly Tyr Asn Ile Asp Val Phe Ser Tyr Gly Ala Pro Arg Val
165 170 175

Gly Asn Arg Ala Phe Ala Glu Phe Leu Thr Ala Gln Thr Gly Gly Thr
180 185 190

Leu Tyr Arg Ile Thr His Thr Asn Asp Ile Val Pro Arg Leu Pro Pro
195 200 205

Arg Asp Trp Gly Tyr Ser His Ser Ser Pro Glu Tyr Trp Val Thr Ser
210 215 220

Gly Asn Asp Val Pro Val Thr Ala Asn Asp Ile Thr Val Val Glu Gly
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<210> 7
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<212> PRT
<213> Aspergillus niger

<400> 7

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Ala Ser Thr Gln Gly Ile Ser Glu Asp Leu Tyr Asn Arg Leu Val Glu
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20 25 30

Ser Thr Ile Ile Lys Gly Glu Lys Ile Tyr Asn Ala Gln Thr Asp Ile
35 40 45

Asn Gly Trp Ile Leu Arg Asp Asp Thr Ser Lys Glu Ile Ile Thr Val
50 55 60

Phe Arg Gly Thr Gly Ser Asp Thr Asn Leu Gln Leu Asp Thr Asn Tyr
65 70 75 80

Thr Leu Thr Pro Phe Asp Thr Leu Pro Gln Cys Asn Asp Cys Glu Val
85 90 95

His Gly Gly Tyr Tyr Ile Gly Trp Ile Ser Val Gln Asp Gln Val Glu
100 105 110

Ser Leu Val Lys Gln Gln Ala Ser Gln Tyr Pro Asp Tyr Ala Leu Thr
115 120 125

Val Thr Gly His Ser Leu Gly Ala Ser Met Ala Ala Leu Thr Ala Ala
130 135 140

Gln Leu Ser Ala Thr Tyr Asp Asn Val Arg Leu Tyr Thr Phe Gly Glu
145 150 155 160

Pro Arg Ser Gly Asn Gln Ala Phe Ala Ser Tyr Met Asn Asp Ala Phe
165 170 175

Gln Val Ser Ser Pro Glu Thr Thr Gln Tyr Phe Arg Val Thr His Ser
180 185 190

Asn Asp Gly Ile Pro Asn Leu Pro Pro Ala Glu Gln Gly Tyr Ala His
195 200 205

Gly Gly Val Glu Tyr Trp Ser Val Asp Pro Tyr Ser Ala Gln Asn Thr
210 215 220

Phe Val Cys Thr Gly Asp Glu Val Gln Cys Cys Glu Ala Gln Gly Gly
225 230 235 240

Gln Gly Val Asn Asp Ala His Thr Thr Tyr Phe Gly Met Thr Ser Gly
245 250 255

Ala Cys Thr Trp Val
260

12 sq listing.ST25 15-MAY-2006