

SEQUENCE LISTING

<110> TAIHO PHARMACEUTICAL CO., LTD.

<120> Novel peptide comprising linearly-connected four-CTL epitope peptides

<130> PH-5981-PCT

<150> JP 2013-218524

<151> 2013-10-21

<150> JP 2014-155132

<151> 2014-07-30

<160> 66

<170> PatentIn version 3.5

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<212> PRT

<213> Homo sapiens

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Lys Leu Val Glu Arg Leu Gly Ala Ala

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<210> 2

<211> 9

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Ala Ser Leu Asp Ser Asp Pro Trp Val

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

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Val Ile Gln Asn Leu Glu Arg Gly Tyr Arg
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Lys Leu Lys His Tyr Gly Pro Gly Trp Val
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Arg Leu Gln Glu Trp Cys Ser Val Ile
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Ile Leu Gly Glu Leu Arg Glu Lys Val
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Asp Tyr Val Arg Glu His Lys Asp Asn Ile
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<400> 18

Arg Tyr Leu Thr Gln Glu Thr Asn Lys Val
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Thr Phe Asp Tyr Leu Arg Ser Val Leu
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Arg Met Phe Pro Asn Ala Pro Tyr Leu
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<210> 21

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<213> Homo sapiens

<400> 21

Thr Tyr Leu Pro Thr Asn Ala Ser Leu
1 5

<210> 22

<211> 43

<212> PRT

<213> Artificial

<220>

<223> synthetic peptide

<400> 22

Asp	Tyr	Ser	Ala	Arg	Trp	Asn	Glu	Ile	Arg	Arg	Val	Tyr	Asp	Tyr	Asn
1				5					10					15	

Cys	His	Val	Asp	Leu	Arg	Arg	Gln	Ile	Arg	Pro	Ile	Phe	Ser	Asn	Arg
			20					25						30	

Arg	Arg	Leu	Leu	Gln	Ala	Glu	Ala	Pro	Arg	Leu
		35					40			

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<213> Artificial

<220>

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<400> 23

Gln	Ile	Arg	Pro	Ile	Phe	Ser	Asn	Arg	Arg	Arg	Asp	Tyr	Ser	Ala	Arg
1				5					10					15	

Trp	Asn	Glu	Ile	Arg	Arg	Val	Tyr	Asp	Tyr	Asn	Cys	His	Val	Asp	Leu
				20				25						30	

Arg	Arg	Leu	Leu	Gln	Ala	Glu	Ala	Pro	Arg	Leu
		35					40			

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<400> 24

Val Tyr Asp Tyr Asn Cys His Val Asp Leu Arg Arg Asp Tyr Ser Ala
1 5 10 15

Arg Trp Asn Glu Ile Arg Arg Gln Ile Arg Pro Ile Phe Ser Asn Arg
20 25 30

Arg Arg Leu Leu Gln Ala Glu Ala Pro Arg Leu
35 40

<210> 25
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<212> PRT
<213> Artificial

<220>
<223> synthetic peptide

<400> 25

Val Tyr Asp Tyr Asn Cys His Val Asp Leu Arg Arg Gln Ile Arg Pro
1 5 10 15

Ile Phe Ser Asn Arg Arg Arg Asp Tyr Ser Ala Arg Trp Asn Glu Ile
20 25 30

Arg Arg Leu Leu Gln Ala Glu Ala Pro Arg Leu
35 40

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<220>
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<400> 26

Gln Ile Arg Pro Ile Phe Ser Asn Arg Arg Arg Val Tyr Asp Tyr Asn
1 5 10 15

Cys His Val Asp Leu Arg Arg Asp Tyr Ser Ala Arg Trp Asn Glu Ile
20 25 30

Arg Arg Leu Leu Gln Ala Glu Ala Pro Arg Leu
35 40

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<213> Artificial

<220>
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<400> 27

Asp Tyr Ser Ala Arg Trp Asn Glu Ile Arg Arg Gln Ile Arg Pro Ile
1 5 10 15

Phe Ser Asn Arg Arg Arg Val Tyr Asp Tyr Asn Cys His Val Asp Leu
20 25 30

Arg Arg Leu Leu Gln Ala Glu Ala Pro Arg Leu
35 40

<210> 28
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<400> 28

Lys Leu Val Glu Arg Leu Gly Ala Ala Arg Arg Leu Tyr Ala Trp Glu
1 5 10 15

Pro Ser Phe Leu Arg Arg Asp Tyr Leu Arg Ser Val Leu Glu Asp Phe
20 25 30

Arg Arg Ala Ser Leu Asp Ser Asp Pro Trp Val
35 40

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<212> PRT
<213> Artificial

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<400> 29

Lys Leu Val Glu Arg Leu Gly Ala Ala Arg Arg Asp Tyr Leu Arg Ser
1 5 10 15

Val Leu Glu Asp Phe Arg Arg Leu Tyr Ala Trp Glu Pro Ser Phe Leu
20 25 30

Arg Arg Ala Ser Leu Asp Ser Asp Pro Trp Val
35 40

<210> 30
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<400> 30

Leu Tyr Ala Trp Glu Pro Ser Phe Leu Arg Arg Lys Leu Val Glu Arg
1 5 10 15

Leu Gly Ala Ala Arg Arg Asp Tyr Leu Arg Ser Val Leu Glu Asp Phe
20 25 30

Arg Arg Ala Ser Leu Asp Ser Asp Pro Trp Val
35 40

<210> 31
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<400> 31

Asp Tyr Leu Arg Ser Val Leu Glu Asp Phe Arg Arg Leu Tyr Ala Trp
1 5 10 15

Glu Pro Ser Phe Leu Arg Arg Lys Leu Val Glu Arg Leu Gly Ala Ala
20 25 30

Arg Arg Ala Ser Leu Asp Ser Asp Pro Trp Val
35 40

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<400> 32

Asp Tyr Leu Arg Ser Val Leu Glu Asp Phe Arg Arg Lys Leu Val Glu
1 5 10 15

Arg Leu Gly Ala Ala Arg Arg Leu Tyr Ala Trp Glu Pro Ser Phe Leu
20 25 30

Arg Arg Ala Ser Leu Asp Ser Asp Pro Trp Val
35 40

<210> 33
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<400> 33

Leu Tyr Ala Trp Glu Pro Ser Phe Leu Arg Arg Arg Leu Gln Glu Trp
1 5 10 15

Cys Ser Val Ile Arg Arg Asp Tyr Leu Arg Ser Val Leu Glu Asp Phe
20 25 30

Arg Arg Ala Ser Leu Asp Ser Asp Pro Trp Val
35 40

<210> 34
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<400> 34

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

Trp Cys Ser Val Ile Arg Arg Leu Tyr Ala Trp Glu Pro Ser Phe Leu
20 25 30

Arg Arg Ala Ser Leu Asp Ser Asp Pro Trp Val
35 40

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Arg Leu Gln Glu Trp Cys Ser Val Ile Arg Arg Leu Tyr Ala Trp Glu
1 5 10 15

Pro Ser Phe Leu Arg Arg Asp Tyr Leu Arg Ser Val Leu Glu Asp Phe
20 25 30

Arg Arg Ala Ser Leu Asp Ser Asp Pro Trp Val
35 40

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<400> 36

Asp Tyr Leu Arg Ser Val Leu Glu Asp Phe Arg Arg Leu Tyr Ala Trp
1 5 10 15

Glu Pro Ser Phe Leu Arg Arg Arg Leu Gln Glu Trp Cys Ser Val Ile
20 25 30

Arg Arg Ala Ser Leu Asp Ser Asp Pro Trp Val
35 40

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<400> 37

Arg Leu Gln Glu Trp Cys Ser Val Ile Arg Arg Asp Tyr Leu Arg Ser
1 5 10 15

Val Leu Glu Asp Phe Arg Arg Leu Tyr Ala Trp Glu Pro Ser Phe Leu
20 25 30

Arg Arg Ala Ser Leu Asp Ser Asp Pro Trp Val
35 40

<210> 38

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<400> 38

Arg Leu Gln Glu Trp Cys Ser Val Ile Arg Arg Asp Tyr Val Arg Glu
1 5 10 15

His Lys Asp Asn Ile Arg Arg Arg Tyr Leu Thr Gln Glu Thr Asn Lys
20 25 30

Val Arg Arg Ile Leu Glu Gln Ser Gly Glu Trp Trp Lys
35 40 45

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<400> 39

Arg Leu Gln Glu Trp Cys Ser Val Ile Arg Arg Arg Tyr Leu Thr Gln
1 5 10 15

Glu Thr Asn Lys Val Arg Arg Asp Tyr Val Arg Glu His Lys Asp Asn
20 25 30

Ile Arg Arg Ile Leu Glu Gln Ser Gly Glu Trp Trp Lys
35 40 45

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<400> 40

Asp Tyr Val Arg Glu His Lys Asp Asn Ile Arg Arg Arg Leu Gln Glu
1 5 10 15

Trp Cys Ser Val Ile Arg Arg Arg Tyr Leu Thr Gln Glu Thr Asn Lys
20 25 30

Val Arg Arg Ile Leu Glu Gln Ser Gly Glu Trp Trp Lys
35 40 45

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<400> 41

Asp Tyr Val Arg Glu His Lys Asp Asn Ile Arg Arg Arg Tyr Leu Thr
1 5 10 15

Gln Glu Thr Asn Lys Val Arg Arg Arg Leu Gln Glu Trp Cys Ser Val
20 25 30

Ile Arg Arg Ile Leu Glu Gln Ser Gly Glu Trp Trp Lys
35 40 45

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<400> 42

Arg Tyr Leu Thr Gln Glu Thr Asn Lys Val Arg Arg Arg Leu Gln Glu
1 5 10 15

Trp Cys Ser Val Ile Arg Arg Asp Tyr Val Arg Glu His Lys Asp Asn
20 25 30

Ile Arg Arg Ile Leu Glu Gln Ser Gly Glu Trp Trp Lys
35 40 45

<210> 43

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<400> 43

Arg	Tyr	Leu	Thr	Gln	Glu	Thr	Asn	Lys	Val	Arg	Arg	Asp	Tyr	Val	Arg
1				5					10					15	

Glu	His	Lys	Asp	Asn	Ile	Arg	Arg	Arg	Leu	Gln	Glu	Trp	Cys	Ser	Val
			20					25					30		

Ile	Arg	Arg	Ile	Leu	Glu	Gln	Ser	Gly	Glu	Trp	Trp	Lys
		35					40					45

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Lys	Leu	Val	Glu	Arg	Leu	Gly	Ala	Ala	Arg	Arg	Asp	Tyr	Val	Arg	Glu
1				5					10					15	

His	Lys	Asp	Asn	Ile	Arg	Arg	Arg	Tyr	Leu	Thr	Gln	Glu	Thr	Asn	Lys
			20					25						30	

Val	Arg	Arg	Ile	Leu	Glu	Gln	Ser	Gly	Glu	Trp	Trp	Lys
			35				40					45

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<220>
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<400> 45

Lys Leu Val Glu Arg Leu Gly Ala Ala Arg Arg Arg Tyr Leu Thr Gln
1 5 10 15

Glu Thr Asn Lys Val Arg Arg Asp Tyr Val Arg Glu His Lys Asp Asn
20 25 30

Ile Arg Arg Ile Leu Glu Gln Ser Gly Glu Trp Trp Lys
35 40 45

<210> 46
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<400> 46

Asp Tyr Val Arg Glu His Lys Asp Asn Ile Arg Arg Lys Leu Val Glu
1 5 10 15

Arg Leu Gly Ala Ala Arg Arg Arg Tyr Leu Thr Gln Glu Thr Asn Lys
20 25 30

Val Arg Arg Ile Leu Glu Gln Ser Gly Glu Trp Trp Lys
35 40 45

<210> 47
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<400> 47

Asp Tyr Val Arg Glu His Lys Asp Asn Ile Arg Arg Arg Tyr Leu Thr
1 5 10 15

Gln Glu Thr Asn Lys Val Arg Arg Lys Leu Val Glu Arg Leu Gly Ala
20 25 30

Ala Arg Arg Ile Leu Glu Gln Ser Gly Glu Trp Trp Lys
35 40 45

<210> 48
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<212> PRT
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<400> 48

Arg Tyr Leu Thr Gln Glu Thr Asn Lys Val Arg Arg Lys Leu Val Glu
1 5 10 15

Arg Leu Gly Ala Ala Arg Arg Asp Tyr Val Arg Glu His Lys Asp Asn
20 25 30

Ile Arg Arg Ile Leu Glu Gln Ser Gly Glu Trp Trp Lys
35 40 45

<210> 49

<211> 45

<212> PRT

<213> Artificial

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<400> 49

Arg Tyr Leu Thr Gln Glu Thr Asn Lys Val Arg Arg Asp Tyr Val Arg
1 5 10 15

Glu His Lys Asp Asn Ile Arg Arg Lys Leu Val Glu Arg Leu Gly Ala
20 25 30

Ala Arg Arg Ile Leu Glu Gln Ser Gly Glu Trp Trp Lys
35 40 45

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<212> PRT

<213> Artificial

<220>

<223> synthetic peptide

<400> 50

Asp Tyr Val Arg Glu His Lys Asp Asn Ile Arg Arg Asn Tyr Ser Val
1 5 10 15

Arg Tyr Arg Pro Gly Leu Arg Arg Arg Leu Gln Glu Trp Cys Ser Val
20 25 30

Ile Arg Arg Ile Leu Glu Gln Ser Gly Glu Trp Trp Lys
35 40 45

<210> 51
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<212> PRT
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<220>
<223> synthetic peptide

<400> 51

Asp Tyr Val Arg Glu His Lys Asp Asn Ile Arg Arg Arg Leu Gln Glu
1 5 10 15

Trp Cys Ser Val Ile Arg Arg Asn Tyr Ser Val Arg Tyr Arg Pro Gly
20 25 30

Leu Arg Arg Ile Leu Glu Gln Ser Gly Glu Trp Trp Lys
35 40 45

<210> 52
<211> 45
<212> PRT
<213> Artificial

<220>
<223> synthetic peptide

<400> 52

Asn Tyr Ser Val Arg Tyr Arg Pro Gly Leu Arg Arg Asp Tyr Val Arg
1 5 10 15

Glu His Lys Asp Asn Ile Arg Arg Arg Leu Gln Glu Trp Cys Ser Val
20 25 30

Ile Arg Arg Ile Leu Glu Gln Ser Gly Glu Trp Trp Lys
35 40 45

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<400> 53

Asn Tyr Ser Val Arg Tyr Arg Pro Gly Leu Arg Arg Arg Leu Gln Glu
1 5 10 15

Trp Cys Ser Val Ile Arg Arg Asp Tyr Val Arg Glu His Lys Asp Asn
20 25 30

Ile Arg Arg Ile Leu Glu Gln Ser Gly Glu Trp Trp Lys
35 40 45

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<220>
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<400> 54

Arg Leu Gln Glu Trp Cys Ser Val Ile Arg Arg Asn Tyr Ser Val Arg
1 5 10 15

Tyr Arg Pro Gly Leu Arg Arg Asp Tyr Val Arg Glu His Lys Asp Asn
20 25 30

Ile Arg Arg Ile Leu Glu Gln Ser Gly Glu Trp Trp Lys
35 40 45

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<400> 55

Arg Leu Gln Glu Trp Cys Ser Val Ile Arg Arg Asp Tyr Val Arg Glu
1 5 10 15

His Lys Asp Asn Ile Arg Arg Asn Tyr Ser Val Arg Tyr Arg Pro Gly
20 25 30

Leu Arg Arg Ile Leu Glu Gln Ser Gly Glu Trp Trp Lys
35 40 45

<210> 56
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<220>
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<400> 56

Val Tyr Asp Tyr Asn Cys His Val Asp Leu Arg Arg Arg Tyr Leu Thr
1 5 10 15

Gln Glu Thr Asn Lys Val Arg Arg Asp Tyr Ser Ala Arg Trp Asn Glu
20 25 30

Ile Arg Arg Gln Ile Arg Pro Ile Phe Ser Asn Arg
35 40

<210> 57
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<213> Artificial

<220>
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<400> 57

Val Tyr Asp Tyr Asn Cys His Val Asp Leu Arg Arg Asp Tyr Ser Ala
1 5 10 15

Arg Trp Asn Glu Ile Arg Arg Arg Tyr Leu Thr Gln Glu Thr Asn Lys
20 25 30

Val Arg Arg Gln Ile Arg Pro Ile Phe Ser Asn Arg
35 40

<210> 58
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<212> PRT
<213> Artificial

<220>
<223> synthetic peptide

<400> 58

Lys Leu Val Glu Arg Leu Gly Ala Ala Arg Arg Leu Tyr Ala Trp Glu
1 5 10 15

Pro Ser Phe Leu Arg Arg Val Tyr Asp Tyr Asn Cys His Val Asp Leu
20 25 30

Arg Arg Asp Tyr Ser Ala Arg Trp Asn Glu Ile
35 40

<210> 59

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<212> PRT

<213> Artificial

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<400> 59

Leu Tyr Ala Trp Glu Pro Ser Phe Leu Arg Arg Lys Leu Val Glu Arg
1 5 10 15

Leu Gly Ala Ala Arg Arg Val Tyr Asp Tyr Asn Cys His Val Asp Leu
20 25 30

Arg Arg Asp Tyr Ser Ala Arg Trp Asn Glu Ile
35 40

<210> 60

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<400> 60

Arg Arg Arg Leu Tyr Ala Trp Glu Pro Ser Phe Leu Arg Arg Arg Leu
1 5 10 15

Gln Glu Trp Cys Ser Val Ile Arg Arg Asp Tyr Leu Arg Ser Val Leu
20 25 30

Glu Asp Phe Arg Arg Ala Ser Leu Asp Ser Asp Pro Trp Val
35 40 45

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<400> 61

Arg Arg Arg Arg Leu Tyr Ala Trp Glu Pro Ser Phe Leu Arg Arg Arg
1 5 10 15

Leu Gln Glu Trp Cys Ser Val Ile Arg Arg Asp Tyr Leu Arg Ser Val
20 25 30

Leu Glu Asp Phe Arg Arg Ala Ser Leu Asp Ser Asp Pro Trp Val
35 40 45

<210> 62

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<400> 62

Leu Tyr Ala Trp Glu Pro Ser Phe Leu Arg Arg Arg Arg Leu Gln Glu
1 5 10 15

Trp Cys Ser Val Ile Arg Arg Arg Asp Tyr Leu Arg Ser Val Leu Glu
20 25 30

Asp Phe Arg Arg Arg Ala Ser Leu Asp Ser Asp Pro Trp Val
35 40 45

<210> 63

<211> 46

<212> PRT

<213> Artificial

<220>

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<400> 63

Arg Arg Arg Asp Tyr Ser Ala Arg Trp Asn Glu Ile Arg Arg Gln Ile
1 5 10 15

Arg Pro Ile Phe Ser Asn Arg Arg Arg Val Tyr Asp Tyr Asn Cys His
20 25 30

Val Asp Leu Arg Arg Leu Leu Gln Ala Glu Ala Pro Arg Leu
35 40 45

<210> 64

<211> 47

<212> PRT

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<400> 64

Arg	Arg	Arg	Arg	Asp	Tyr	Ser	Ala	Arg	Trp	Asn	Glu	Ile	Arg	Arg	Gln
1				5					10					15	

Ile	Arg	Pro	Ile	Phe	Ser	Asn	Arg	Arg	Arg	Val	Tyr	Asp	Tyr	Asn	Cys
			20						25					30	

His	Val	Asp	Leu	Arg	Arg	Leu	Leu	Gln	Ala	Glu	Ala	Pro	Arg	Leu
			35				40						45	

<210> 65

<211> 48

<212> PRT

<213> Artificial

<220>

<223> synthetic peptide

<400> 65

Arg	Arg	Arg	Asp	Tyr	Val	Arg	Glu	His	Lys	Asp	Asn	Ile	Arg	Arg	Arg
1				5					10					15	

Tyr	Leu	Thr	Gln	Glu	Thr	Asn	Lys	Val	Arg	Arg	Lys	Leu	Val	Glu	Arg
			20					25					30		

Leu	Gly	Ala	Ala	Arg	Arg	Ile	Leu	Glu	Gln	Ser	Gly	Glu	Trp	Trp	Lys
			35				40						45		

<210> 66
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<213> Artificial

<220>
<223> synthetic peptide

<400> 66

Arg Arg Arg Arg Asp Tyr Val Arg Glu His Lys Asp Asn Ile Arg Arg
1 5 10 15

Arg Tyr Leu Thr Gln Glu Thr Asn Lys Val Arg Arg Lys Leu Val Glu
20 25 30

Arg Leu Gly Ala Ala Arg Arg Ile Leu Glu Gln Ser Gly Glu Trp Trp
35 40 45

Lys