

OPA17115 Sequence listing_5001264_1 (2)

<110> HANMI PHARM. CO., LTD.

<120> glucagon derivative, conjugate thereof, composition comprising same, and therapeutic use thereof

<130> OPA17115

<150> KR 10-2016-0081995
<151> 2016-06-29

<150> KR 10-2016-0182982
<151> 2016-12-29

<150> KR 10-2017-0069217
<151> 2017-06-02

<160> 50

<170> KoPatentIn 3.0

<210> 1
<211> 29
<212> PRT
<213> homo sapiens

<400> 1
His Ser Gln Gly Thr Phe Thr Ser Asp Tyr Ser Lys Tyr Leu Asp Ser
1 5 10 15
Arg Arg Ala Gln Asp Phe Val Gln Trp Leu Met Asn Thr
20 25

<210> 2
<211> 29
<212> PRT
<213> Artificial Sequence

<220>
<223> glucagon derivative

<400> 2
His Ser Gln Gly Thr Phe Thr Ser Asp Tyr Ser Lys Tyr Leu Asp Cys
1 5 10 15
Asp Arg Ala Gln Asp Phe Val Gln Trp Leu Met Asn Thr
20 25

<210> 3
<211> 29
<212> PRT
<213> Artificial Sequence

<220>
<223> glucagon derivative

<400> 3
His Ser Gln Gly Thr Phe Thr Ser Asp Tyr Ser Lys Tyr Leu Asp Cys
1 5 10 15
Glu Arg Ala Gln Asp Phe Val Gln Trp Leu Met Asn Thr
20 25

<210> 4

OPA17115 Sequence listing_5001264_1 (2)

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

<220>
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<400> 4
 His Ser Gln Gly Thr Phe Thr Ser Asp Tyr Ser Lys Tyr Leu Asp Ser
 1 5 10 15

Cys Asp Ala Gln Asp Phe Val Gln Trp Leu Met Asn Thr
 20 25

<210> 5
 <211> 29
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> glucagon derivative

<400> 5
 His Ser Gln Gly Thr Phe Thr Ser Asp Tyr Ser Lys Tyr Leu Asp Ser
 1 5 10 15

Cys Glu Ala Gln Asp Phe Val Gln Trp Leu Met Asn Thr
 20 25

<210> 6
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 <212> PRT
 <213> Artificial Sequence

<220>
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<400> 6
 His Ser Gln Gly Thr Phe Thr Ser Asp Tyr Ser Lys Tyr Leu Asp Ser
 1 5 10 15

Cys Glu Ala Asp Asp Phe Val Gln Trp Leu Met Asn Thr
 20 25

<210> 7
 <211> 29
 <212> PRT
 <213> Artificial Sequence

<220>
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<400> 7
 Tyr Ser Gln Gly Thr Phe Thr Ser Asp Tyr Ser Lys Tyr Leu Asp Ser
 1 5 10 15

Cys Glu Ala Asp Asp Phe Val Gln Trp Leu Met Asn Thr
 20 25

<210> 8

OPA17115 Sequence listing_5001264_1 (2)

<211> 29
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 <213> Artificial Sequence

<220>
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<220>
 <221> MISC_FEATURE
 <222> (2)
 <223> Xaa is aminoisobutyric acid (Aib)

<400> 8
 Tyr Xaa Gln Gly Thr Phe Thr Ser Asp Tyr Ser Lys Tyr Leu Asp Ser
 1 5 10 15
 Cys Asp Ala Gln Asp Phe Val Gln Trp Leu Ile Asn Thr
 20 25

<210> 9
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<220>
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 <222> (2)
 <223> Xaa is aminoisobutyric acid (Aib)

<400> 9
 Tyr Xaa Gln Gly Thr Phe Thr Ser Asp Tyr Ser Lys Tyr Leu Asp Ser
 1 5 10 15
 Cys Asp Ala Gln Asp Phe Val Val Trp Leu Ile Asn Thr
 20 25

<210> 10
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 <223> Xaa is aminoisobutyric acid (Aib)

<400> 10
 Tyr Xaa Gln Gly Thr Phe Thr Ser Asp Tyr Ser Lys Tyr Leu Asp Ser
 1 5 10 15
 Cys Asp Ala Asp Asp Phe Val Val Trp Leu Ile Asn Thr
 20 25

OPA17115 Sequence listing_5001264_1 (2)

<210> 11
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 <222> (2)
 <223> Xaa is aminoisobutyric acid (Aib)

 <400> 11
 Tyr Xaa Gln Gly Thr Phe Thr Ser Asp Tyr Ser Lys Tyr Leu Asp Glu
 1 5 10 15
 Lys Cys Ala Lys Glu Phe Val Gln Trp Leu Met Asn Thr
 20 25

 <210> 12
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 <212> PRT
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 <222> (2)
 <223> Xaa is aminoisobutyric acid (Aib)

 <220>
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 <222> (16)..(20)
 <223> amino acids at positions 16 and 20 form a ring

 <400> 12
 Tyr Xaa Gln Gly Thr Phe Thr Ser Asp Tyr Ser Lys Tyr Leu Asp Glu
 1 5 10 15
 Lys Arg Ala Lys Glu Phe Val Gln Trp Leu Met Asn Thr Cys
 20 25 30

 <210> 13
 <211> 29
 <212> PRT
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 <220>
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 <223> Xaa is aminoisobutyric acid (Aib)

 <400> 13

OPA17115 Sequence listing_5001264_1 (2)

Tyr Xaa Gln Gly Thr Phe Thr Ser Asp Tyr Ser Cys Tyr Leu Asp Ser
 1 5 10 15

Arg Arg Ala Gln Asp Phe Val Gln Trp Leu Met Asn Thr
 20 25

<210> 14
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<220>
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 <222> (2)
 <223> Xaa is aminoisobutyric acid (Aib)

<400> 14
 Tyr Xaa Gln Gly Thr Phe Thr Ser Asp Tyr Ser Lys Tyr Leu Asp Cys
 1 5 10 15

Lys Arg Ala Lys Glu Phe Val Gln Trp Leu Met Asn Thr
 20 25

<210> 15
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<220>
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 <222> (2)
 <223> Xaa is aminoisobutyric acid (Aib)

<400> 15
 Tyr Xaa Gln Gly Thr Phe Thr Ser Asp Tyr Ser Lys Tyr Leu Cys Glu
 1 5 10 15

Lys Arg Ala Gln Asp Phe Val Val Trp Leu Met Asn Thr
 20 25

<210> 16
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OPA17115 Sequence listing_5001264_1 (2)

<400> 16
 Tyr Xaa Gln Gly Thr Phe Thr Ser Asp Tyr Ser Lys Tyr Leu Asp Cys
 1 5 10 15
 Arg Arg Ala Gln Val Phe Val Gln Trp Leu Met Arg Thr
 20 25

<210> 17
 <211> 29
 <212> PRT
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<220>
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<220>
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<400> 17
 Tyr Xaa Gln Gly Thr Phe Thr Ser Asp Tyr Ser Lys Tyr Leu Asp Cys
 1 5 10 15
 Val Arg Ala Gln Asp Phe Val Gln Trp Leu Met Arg Thr
 20 25

<210> 18
 <211> 29
 <212> PRT
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<220>
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<220>
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 <222> (2)
 <223> Xaa is aminoisobutyric acid (Aib)

<400> 18
 Tyr Xaa Gln Gly Thr Phe Thr Ser Asp Tyr Ser Lys Tyr Leu Asp Ser
 1 5 10 15
 Arg Arg Ala Cys Asp Phe Arg Leu Trp Leu Met Asn Thr
 20 25

<210> 19
 <211> 29
 <212> PRT
 <213> Artificial Sequence

<220>
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<220>
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 <223> Xaa is aminoisobutyric acid (Aib)

OPA17115 Sequence listing_5001264_1 (2)

<220>
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 <222> (16)..(20)
 <223> amino acids at positions 16 and 20 form a ring

<400> 19
 Tyr Xaa Gln Gly Thr Phe Thr Ser Asp Tyr Ser Lys Tyr Leu Cys Glu
 1 5 10 15
 Lys Arg Ala Lys Glu Phe Val Gln Trp Leu Met Asn Thr
 20 25

<210> 20
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<220>
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 <223> amino acids at positions 16 and 20 form a ring

<400> 20
 Tyr Xaa Gln Gly Thr Phe Thr Ser Asp Tyr Ser Lys Tyr Leu Asp Glu
 1 5 10 15
 Cys Arg Ala Lys Glu Phe Val Gln Trp Leu Met Asn Thr
 20 25

<210> 21
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<220>
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 <222> (16)..(20)
 <223> amino acids at positions 16 and 20 form a ring

<400> 21
 Tyr Xaa Gln Gly Thr Phe Thr Ser Asp Tyr Ser Lys Tyr Leu Asp Glu
 1 5 10 15

OPA17115 Sequence listing_5001264_1 (2)

Lys Cys Ala Lys Glu Phe Val Gln Trp Leu Met Asn Thr
 20 25

<210> 22
 <211> 29
 <212> PRT
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<220>
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 <223> Xaa is aminoisobutyric acid (Aib)

<220>
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 <222> (16)..(20)
 <223> amino acids at positions 16 and 20 form a ring

<400> 22
 Tyr Xaa Gln Gly Thr Phe Thr Ser Asp Tyr Ser Lys Tyr Leu Asp Glu
 1 5 10 15

Lys Arg Cys Lys Glu Phe Val Gln Trp Leu Met Asn Thr
 20 25

<210> 23
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<220>
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 <222> (16)..(20)
 <223> amino acids at positions 16 and 20 form a ring

<400> 23
 Tyr Xaa Gln Gly Thr Phe Thr Ser Asp Tyr Ser Lys Tyr Cys Asp Glu
 1 5 10 15

Lys Arg Ala Lys Glu Phe Val Gln Trp Leu Met Asn Thr
 20 25

<210> 24
 <211> 29
 <212> PRT
 <213> Artificial Sequence

OPA17115 Sequence listing_5001264_1 (2)

<220>
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<220>
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 <222> (2)
 <223> Xaa is aminoisobutyric acid (Aib)

<220>
 <221> MISC_FEATURE
 <222> (16)..(20)
 <223> amino acids at positions 16 and 20 form a ring

<400> 24
 Tyr Xaa Gln Gly Thr Phe Thr Ser Asp Tyr Ser Lys Cys Leu Asp Glu
 1 5 10 15
 Lys Arg Ala Lys Glu Phe Val Gln Trp Leu Met Asn Thr
 20 25

<210> 25
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 <212> PRT
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 <223> Xaa is aminoisobutyric acid (Aib)

<220>
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 <222> (16)..(20)
 <223> amino acids at positions 16 and 20 form a ring

<400> 25
 Tyr Xaa Gln Gly Thr Phe Thr Ser Asp Tyr Ser Lys Tyr Leu Asp Glu
 1 5 10 15
 Lys Arg Ala Lys Cys Phe Val Gln Trp Leu Met Asn Thr
 20 25

<210> 26
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<220>
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 <223> Xaa is aminoisobutyric acid (Aib)

OPA17115 Sequence listing_5001264_1 (2)

<220>
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 <222> (16)..(20)
 <223> amino acids at positions 16 and 20 form a ring

<400> 26
 Trp Xaa Gln Gly Thr Phe Thr Ser Asp Tyr Ser Lys Tyr Leu Asp Glu
 1 5 10 15
 Cys Arg Ala Lys Asp Phe Val Gln Trp Leu Met Asn Thr
 20 25

<210> 27
 <211> 29
 <212> PRT
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<220>
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 <223> Xaa is aminoisobutyric acid (Aib)

<220>
 <221> MISC_FEATURE
 <222> (16)..(20)
 <223> amino acids at positions 16 and 20 form a ring

<400> 27
 Tyr Xaa Gln Gly Thr Phe Val Ser Asp Tyr Ser Lys Tyr Leu Asp Glu
 1 5 10 15
 Cys Arg Ala Lys Asp Phe Val Gln Trp Leu Met Asn Thr
 20 25

<210> 28
 <211> 29
 <212> PRT
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<220>
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<220>
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 <223> Xaa is aminoisobutyric acid (Aib)

<220>
 <221> MISC_FEATURE
 <222> (16)..(20)
 <223> amino acids at positions 16 and 20 form a ring

<400> 28
 Trp Xaa Gln Gly Thr Phe Val Ser Asp Tyr Ser Lys Tyr Leu Asp Glu
 1 5 10 15

OPA17115 Sequence listing_5001264_1 (2)
 Cys Arg Ala Lys Asp Phe Val Gln Trp Leu Met Asn Thr
 20 25

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

<220>
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<220>
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 <222> (2)
 <223> Xaa is aminoisobutyric acid (Aib)

<220>
 <221> MISC_FEATURE
 <222> (16)..(20)
 <223> amino acids at positions 16 and 20 form a ring

<400> 29
 Tyr Xaa Gln Gly Thr Phe Thr Ser Asp Tyr Ser Lys Cys Leu Asp Glu
 1 5 10 15

Arg Arg Ala Lys Asp Phe Val Gln Trp Leu Met Asn Thr
 20 25

<210> 30
 <211> 29
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> glucagon derivative

<220>
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 <222> (2)
 <223> Xaa is aminoisobutyric acid (Aib)

<220>
 <221> MISC_FEATURE
 <222> (16)..(20)
 <223> amino acids at positions 16 and 20 form a ring

<400> 30
 Trp Xaa Gln Gly Thr Phe Thr Ser Asp Tyr Ser Lys Cys Leu Asp Glu
 1 5 10 15

Arg Arg Ala Lys Asp Phe Val Gln Trp Leu Met Asn Thr
 20 25

<210> 31
 <211> 29
 <212> PRT
 <213> Artificial Sequence

<220>

OPA17115 Sequence listing_5001264_1 (2)
 <223> glucagon derivative

<220>
 <221> MISC_FEATURE
 <222> (2)
 <223> Xaa is aminoisobutyric acid (Aib)

<220>
 <221> MISC_FEATURE
 <222> (17)..(21)
 <223> amino acids at positions 17 and 21 form a ring

<400> 31
 Tyr Xaa Gln Gly Thr Phe Thr Ser Asp Tyr Ser Lys Tyr Leu Asp Cys
 1 5 10 15
 Lys Arg Ala Lys Glu Phe Val Gln Trp Leu Met Asn Thr
 20 25

<210> 32
 <211> 28
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> glucagon derivative

<220>
 <221> MISC_FEATURE
 <222> (15)..(19)
 <223> amino acids at positions 15 and 19 form a ring

<400> 32
 Ser Gln Gly Thr Phe Thr Ser Asp Tyr Ser Lys Tyr Leu Asp Glu Cys
 1 5 10 15
 Arg Ala Lys Glu Phe Val Gln Trp Leu Met Asn Thr
 20 25

<210> 33
 <211> 29
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> glucagon derivative

<220>
 <221> MISC_FEATURE
 <222> (2)
 <223> Xaa is aminoisobutyric acid (Aib)

<400> 33
 Tyr Xaa Gln Gly Thr Phe Thr Ser Asp Tyr Ser Lys Tyr Leu Asp Ser
 1 5 10 15
 Arg Arg Ala Gln Asp Phe Val Gln Trp Leu Met Asn Thr
 20 25

OPA17115 Sequence listing_5001264_1 (2)

<210> 34
 <211> 29
 <212> PRT
 <213> Artificial Sequence

 <220>
 <223> glucagon derivative

 <220>
 <221> MISC_FEATURE
 <222> (2)
 <223> Xaa is aminoisobutyric acid (Aib)

 <220>
 <221> MISC_FEATURE
 <222> (16)..(20)
 <223> amino acids at positions 16 and 20 form a ring

 <400> 34
 Trp Xaa Gln Gly Thr Phe Thr Ser Asp Tyr Ser Lys Tyr Cys Asp Glu
 1 5 10 15
 Arg Arg Ala Lys Glu Phe Val Gln Trp Leu Met Asn Thr
 20 25

 <210> 35
 <211> 29
 <212> PRT
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 <220>
 <223> glucagon derivative

 <220>
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 <222> (2)
 <223> Xaa is aminoisobutyric acid (Aib)

 <220>
 <221> MISC_FEATURE
 <222> (16)..(20)
 <223> amino acids at positions 16 and 20 form a ring

 <400> 35
 Tyr Xaa Gln Gly Thr Phe Thr Ser Asp Tyr Ser Lys Tyr Cys Asp Glu
 1 5 10 15
 Arg Arg Ala Lys Glu Phe Val Gln Trp Leu Met Asn Thr
 20 25

 <210> 36
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 <220>
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OPA17115 Sequence listing_5001264_1 (2)

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 <223> Xaa is aminoisobutyric acid (Aib)

<220>
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 <222> (16)..(20)
 <223> amino acids at positions 16 and 20 form a ring

<400> 36
 Tyr Xaa Gln Gly Thr Phe Thr Ser Asp Cys Ser Lys Tyr Leu Asp Glu
 1 5 10 15
 Arg Arg Ala Lys Glu Phe Val Gln Trp Leu Met Asn Thr
 20 25

<210> 37
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 <223> Xaa is aminoisobutyric acid (Aib)

<220>
 <221> MISC_FEATURE
 <222> (16)..(20)
 <223> amino acids at positions 16 and 20 form a ring

<400> 37
 Tyr Xaa Gln Gly Thr Phe Thr Ser Asp Tyr Ser Lys Tyr Leu Asp Glu
 1 5 10 15
 Arg Arg Ala Lys Glu Phe Val Gln Trp Leu Met Asn Thr Cys
 20 25 30

<210> 38
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<220>
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<220>
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 <222> (2)
 <223> Xaa is aminoisobutyric acid (Aib)

<220>
 <221> MISC_FEATURE
 <222> (16)..(20)
 <223> amino acids at positions 16 and 20 form a ring

OPA17115 Sequence listing_5001264_1 (2)

<400> 38
 Tyr Xaa Gln Gly Thr Phe Cys Ser Asp Tyr Ser Lys Tyr Leu Asp Glu
 1 5 10 15

Arg Arg Ala Lys Glu Phe Val Gln Trp Leu Met Asn Thr
 20 25

<210> 39
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 <212> PRT
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<220>
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<220>
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 <222> (2)
 <223> Xaa is aminoisobutyric acid (Aib)

<220>
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 <222> (16)..(20)
 <223> amino acids at positions 16 and 20 form a ring

<400> 39
 Tyr Xaa Gln Gly Thr Phe Val Ser Asp Cys Ser Lys Tyr Leu Asp Glu
 1 5 10 15

Arg Arg Ala Lys Asp Phe Val Gln Trp Leu Met Asn Thr
 20 25

<210> 40
 <211> 30
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> glucagon derivative

<220>
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 <222> (2)
 <223> Xaa is aminoisobutyric acid (Aib)

<220>
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 <222> (16)..(20)
 <223> amino acids at positions 16 and 20 form a ring

<400> 40
 Tyr Xaa Gln Gly Thr Phe Val Ser Asp Tyr Ser Lys Tyr Leu Asp Glu
 1 5 10 15

Arg Arg Ala Lys Asp Phe Val Gln Trp Leu Met Asn Thr Cys
 20 25 30

OPA17115 Sequence listing_5001264_1 (2)

<210> 41
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 <212> PRT
 <213> Artificial Sequence

<220>
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<220>
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 <222> (2)
 <223> Xaa is aminoisobutyric acid (Aib)

<220>
 <221> MISC_FEATURE
 <222> (16)..(20)
 <223> amino acids at positions 16 and 20 form a ring

<400> 41
 Tyr Xaa Gln Gly Thr Phe Cys Ser Asp Tyr Ser Lys Tyr Leu Asp Glu
 1 5 10 15

Arg Arg Ala Lys Asp Phe Val Gln Trp Leu Met Asn Thr
 20 25

<210> 42
 <211> 29
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> glucagon derivative

<220>
 <221> MISC_FEATURE
 <222> (2)
 <223> Xaa is aminoisobutyric acid (Aib)

<400> 42
 Tyr Xaa Gln Gly Thr Phe Cys Ser Asp Tyr Ser Lys Tyr Leu Asp Ser
 1 5 10 15

Arg Arg Ala Gln Asp Phe Val Gln Trp Leu Met Asn Thr
 20 25

<210> 43
 <211> 29
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> glucagon derivative

<220>
 <221> MISC_FEATURE
 <222> (2)
 <223> Xaa is aminoisobutyric acid (Aib)

<400> 43

OPA17115 Sequence listing_5001264_1 (2)

Tyr Xaa Gln Gly Thr Phe Thr Ser Asp Cys Ser Lys Tyr Leu Asp Ser
 1 5 10 15

Arg Arg Ala Gln Asp Phe Val Gln Trp Leu Met Asn Thr
 20 25

<210> 44
 <211> 30
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> glucagon derivative

<220>
 <221> MISC_FEATURE
 <222> (2)
 <223> Xaa is aminoisobutyric acid (Aib)

<400> 44
 Tyr Xaa Gln Gly Thr Phe Thr Ser Asp Tyr Ser Lys Tyr Leu Asp Ser
 1 5 10 15

Arg Arg Ala Gln Asp Phe Val Gln Trp Leu Met Asn Thr Cys
 20 25 30

<210> 45
 <211> 30
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> glucagon derivative

<220>
 <221> MISC_FEATURE
 <222> (1)
 <223> Xaa is histidine, desamino-histidyl, N-dimethyl-histidyl, beta-hydroxy imidazopropionyl, 4-imidazoacetyl, beta-carboxy imidazopropionyl, tryptophan, or tyrosine, or is absent

<220>
 <221> MISC_FEATURE
 <222> (2)
 <223> Xaa is alpha-methyl-glutamic acid, aminoisobutyric acid (Aib), D-alanine, glycine, Sar (N-methylglycine), serine, or D-serine

<220>
 <221> MISC_FEATURE
 <222> (7)
 <223> Xaa is threonine, valine, or cysteine

<220>
 <221> MISC_FEATURE
 <222> (10)
 <223> Xaa is tyrosine or cysteine

<220>
 <221> MISC_FEATURE

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<222> (12)
 <223> Xaa is lysine or cysteine

<220>
 <221> MISC_FEATURE
 <222> (13)
 <223> Xaa is tyrosine or cysteine

<220>
 <221> MISC_FEATURE
 <222> (14)
 <223> Xaa is leucine or cysteine

<220>
 <221> MISC_FEATURE
 <222> (15)
 <223> Xaa is aspartic acid, glutamic acid, or cysteine

<220>
 <221> MISC_FEATURE
 <222> (16)
 <223> Xaa is glutamic acid, aspartic acid, serine,
 alpha-methyl-glutamic acid, or cysteine, or is absent;

<220>
 <221> MISC_FEATURE
 <222> (17)
 <223> Xaa is aspartic acid, glutamine, glutamic acid, lysine, arginine,
 serine, cysteine, or valine, or is absent

<220>
 <221> MISC_FEATURE
 <222> (18)
 <223> Xaa is alanine, aspartic acid, glutamic acid, arginine, valine,
 or cysteine, or is absent

<220>
 <221> MISC_FEATURE
 <222> (19)
 <223> Xaa is alanine, arginine, serine, valine, or cysteine, or is
 absent

<220>
 <221> MISC_FEATURE
 <222> (20)
 <223> Xaa is lysine, histidine, glutamine, aspartic acid, lysine,
 arginine, alpha-methyl-glutamic acid, or cysteine, or is absent

<220>
 <221> MISC_FEATURE
 <222> (21)
 <223> Xaa is aspartic acid, glutamic acid, leucine, valine, or
 cysteine, or is absent

<220>
 <221> MISC_FEATURE
 <222> (23)
 <223> Xaa is isoleucine, valine, or arginine, or is absent

OPA17115 Sequence listing_5001264_1 (2)

<220>
 <221> MISC_FEATURE
 <222> (24)
 <223> Xaa is valine, arginine, alanine, cysteine, glutamic acid, lysine, glutamine, alpha-methyl-glutamic acid, or leucine, or is absent;

<220>
 <221> MISC_FEATURE
 <222> (27)
 <223> Xaa is isoleucine, valine, alanine, lysine, methionine, glutamine, or arginine, or is absent

<220>
 <221> MISC_FEATURE
 <222> (28)
 <223> Xaa is glutamine, lysine, asparagine, or arginine, or is absent

<220>
 <221> MISC_FEATURE
 <222> (29)
 <223> Xaa is lysine, alanine, glycine, or threonine, or is absent

<220>
 <221> MISC_FEATURE
 <222> (30)
 <223> Xaa is cysteine, or is absent

<400> 45
 Xaa Xaa Gln Gly Thr Phe Xaa Ser Asp Xaa Ser Xaa Xaa Xaa Xaa Xaa
 1 5 10 15
 Xaa Xaa Xaa Xaa Xaa Phe Xaa Xaa Trp Leu Xaa Xaa Xaa Xaa
 20 25 30

<210> 46
 <211> 30
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> glucagon derivative

<220>
 <221> MISC_FEATURE
 <222> (2)
 <223> Xaa is aminoisobutyric acid (Aib)

<220>
 <221> MISC_FEATURE
 <222> (7)
 <223> Xaa is threonine, valine, or cysteine

<220>
 <221> MISC_FEATURE
 <222> (10)
 <223> Xaa is tyrosine or cysteine

OPA17115 Sequence listing_5001264_1 (2)

<220>
 <221> MISC_FEATURE
 <222> (12)
 <223> Xaa is lysine or cysteine

<220>
 <221> MISC_FEATURE
 <222> (15)
 <223> Xaa is aspartic acid or cysteine

<220>
 <221> MISC_FEATURE
 <222> (16)
 <223> Xaa is glutamic acid or serine

<220>
 <221> MISC_FEATURE
 <222> (17)
 <223> Xaa is lysine or arginine

<220>
 <221> MISC_FEATURE
 <222> (20)
 <223> Xaa is glutamine or lysine

<220>
 <221> MISC_FEATURE
 <222> (21)
 <223> Xaa is aspartic acid or glutamic acid

<220>
 <221> MISC_FEATURE
 <222> (24)
 <223> Xaa is valine or glutamine

<220>
 <221> MISC_FEATURE
 <222> (30)
 <223> Xaa is cysteine or is absent

<400> 46
 Tyr Xaa Gln Gly Thr Phe Xaa Ser Asp Xaa Ser Xaa Tyr Leu Xaa Xaa
 1 5 10 15
 Xaa Arg Ala Xaa Xaa Phe Val Xaa Trp Leu Met Asn Thr Xaa
 20 25 30

<210> 47
 <211> 34
 <212> DNA
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<220>
 <223> forward primer

<400> 47

OPA17115 Sequence listing_5001264_1 (2) 34
 cagcgacacc gaccgtcccc ccgtacttaa ggcc

<210> 48
 <211> 32
 <212> DNA
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<220>
 <223> reverse primer

<400> 48 32
 ctaaccgact ctcggggaag actgagctcg cc

<210> 49
 <211> 29
 <212> PRT
 <213> Artificial Sequence

<220>
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<220>
 <221> MISC_FEATURE
 <222> (2)
 <223> Xaa is aminoisobutyric acid

<400> 49
 Tyr Xaa Gln Gly Thr Phe Thr Ser Asp Tyr Ser Cys Tyr Leu Asp Glu
 1 5 10 15
 Lys Arg Ala Lys Glu Phe Val Gln Trp Leu Met Asn Thr
 20 25

<210> 50
 <211> 29
 <212> PRT
 <213> Artificial Sequence

<220>
 <223> glucagon derivative

<220>
 <221> MISC_FEATURE
 <222> (2)
 <223> Xaa is aminoisobutyric acid

<400> 50
 Tyr Xaa Gln Gly Thr Phe Thr Ser Asp Tyr Ser Lys Tyr Leu Cys Glu
 1 5 10 15
 Lys Arg Ala Gln Asp Phe Val Gln Trp Leu Met Asn Thr
 20 25