

PhoenixTemp17731.tmp.txt
SEQUENCE LISTING

<110> Paul - Ehrlich Institut
Paul - Ehrlich - Institut

<120> Recombinant modified vaccinia virus Ankara (MVA) -based vaccine
for the avian flu

<130> N 1249 PCT BLN

<160> 15

<170> Patent In version 3.3

<210> 1
<211> 1500
<212> DNA
<213> Avian influenza virus (H5N1)

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ccagt caat g acct ct gt t a cccaggggat t t caat gact at gaagaat t gaaacacct a 360
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aat aat acca accaagaaga t ctt t t ggt a ct gt ggggga t t caccat cc t aat gat gcg 600
gcagagcaga caaagct ct a t caaaacca accacct at a ttt ccgt t gg gacat caaca 660
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aggat ggagt t ct t ct ggac aat t t t aaaa ccgaat gat g caat caact t cgagagt aat 780
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Phoeni xTemp17731. t mp. t xt

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 <212> DNA
 <213> Avi an i nfl uenza vi rus (H5N1)

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 act gt t acac at gccaaga cat act ggaa aagacacaca at gggaagct ct gcgat ct a 180
 gat ggagt ga agcct ct aat t t t gagagat t gt agt gt ag ct ggat ggct cct cggaaac 240
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 ccagt caat g acct ct gt t a cccaggggat t t caat gact at gaagaat t gaaacacct a 360
 t t gaggagaa t aaaccat t t t gagaaaaat t cagat cat cc ccaaaagt t c t t ggt ccagt 420
 cat gaagcct cat t ggggggt gagct cagca t gt ccat acc agggaaagt c ct cct t t t t c 480
 agaaat gt gg t at ggct t at caaaaagaac agt acat acc caacaat aaa gaggagct ac 540
 aat aat acca accaagaaga t ct t t t ggt a ct gt ggggga t t caccat cc t aat gat gcg 600
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 <213> Avi an i nfl uenza vi rus (H5N1)

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 cccaaaagt t ct t ggt ccag t cat gaagcc t cat t ggggg t gagct cagc at gt ccat ac 420
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Phoeni xTemp17731. tmp. txt

ccaacaat aa agaggagct a caat aat acc aaccaagaag at ctttt ggt act gt ggggg 540
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 attt ccgtt g ggacat caac act aaaccag agat t ggt ac caagaat agc t act agat cc 660
 aaagt aaacg ggcaaagt gg aaggat ggag t t ct t ct gga caat t t t aaa accgaat gat 720
 gcaat caact t cgagagt aa t ggaaat t t c att gct ccag aat at gcat a caaaat t gt c 780
 aagaaagggg act caacaat t at gaaaagt gaat t ggaat at ggt aact g caacaccaag 840
 t gt caaact c caat gggggc gat aaact ct agcat gccat t ccacaat at acaccct ct c 900
 accat cgggg aat gccccaa at at gt gaaa t caaacagat t agt cct t gc gact gggct c 960
 agaaat agcc ct caaagaga gagaagaaga aaaaagagag gat t at t t gg agct at agca 1020
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<210> 4
 <211> 337
 <212> PRT
 <213> Avian influenza virus (H5N1)
 <400> 4

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Gln Val Asp Thr Ile Met Glu Lys Asn Val Thr Val Thr His Ala Gln
 20 25 30

Asp Ile Leu Glu Lys Thr His Asn Gly Lys Leu Cys Asp Leu Asp Gly
 35 40 45

Val Lys Pro Leu Ile Leu Arg Asp Cys Ser Val Ala Gly Trp Leu Leu
 50 55 60

Gly Asn Pro Met Cys Asp Glu Phe Ile Asn Val Pro Glu Trp Ser Tyr
 65 70 75 80

Ile Val Glu Lys Ala Asn Pro Val Asn Asp Leu Cys Tyr Pro Gly Asp
 85 90 95

Phe Asn Asp Tyr Glu Glu Leu Lys His Leu Leu Ser Arg Ile Asn His
 100 105 110

Phe Glu Lys Ile Gln Ile Ile Pro Lys Ser Ser Trp Ser Ser His Glu
 115 120 125

Ala Ser Leu Gly Val Ser Ser Ala Cys Pro Tyr Gln Gly Lys Ser Ser
 130 135 140

Phe Phe Arg Asn Val Val Trp Leu Ile Lys Lys Asn Ser Thr Tyr Pro
 145 150 155 160

Thr Ile Lys Arg Ser Tyr Asn Asn Thr Asn Gln Glu Asp Leu Leu Val

165

170

175

Leu Trp Gly Ile His His Pro Asn Asp Ala Ala Glu Gln Thr Lys Leu
180 185 190

Tyr Gln Asn Pro Thr Thr Tyr Ile Ser Val Gly Thr Ser Thr Leu Asn
195 200 205

Gln Arg Leu Val Pro Arg Ile Ala Thr Arg Ser Lys Val Asn Gly Gln
210 215 220

Ser Gly Arg Met Glu Phe Phe Trp Thr Ile Leu Lys Pro Asn Asp Ala
225 230 235 240

Ile Asn Phe Glu Ser Asn Gly Asn Phe Ile Ala Pro Glu Tyr Ala Tyr
245 250 255

Lys Ile Val Lys Lys Gly Asp Ser Thr Ile Met Lys Ser Glu Leu Glu
260 265 270

Tyr Gly Asn Cys Asn Thr Lys Cys Gln Thr Pro Met Gly Ala Ile Asn
275 280 285

Ser Ser Met Pro Phe His Asn Ile His Pro Leu Thr Ile Gly Glu Cys
290 295 300

Pro Lys Tyr Val Lys Ser Asn Arg Leu Val Leu Ala Thr Gly Leu Arg
305 310 315 320

Asn Ser Pro Gln Arg Glu Arg Arg Arg Lys Lys Arg Gly Leu Phe Gly
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<210> 5

<211> 149

<212> PRT

<213> Avian influenza virus (H5N1)

<400> 5

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

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

Ser Ile Ile Asp Lys Met Asn Thr Gln Phe Glu Ala Val Gly Arg Glu
50 55 60

PhoenixTemp17731.tmp.txt

Phe Asn Asn Leu Glu Arg Arg Ile Glu Asn Leu Asn Lys Lys Met Glu
65 70 75 80

Asp Gly Phe Leu Asp Val Trp Thr Tyr Asn Ala Glu Leu Leu Val Leu
85 90 95

Met Glu Asn Glu Arg Thr Leu Asp Phe His Asp Ser Asn Val Lys Asn
100 105 110

Leu Tyr Asp Lys Val Arg Leu Gln Leu Arg Asp Asn Ala Lys Glu Leu
115 120 125

Gly Asn Gly Cys Phe Glu Phe Tyr His Lys Cys Asp Asn Glu Cys Met
130 135 140

Glu Ser Val Arg Asn
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<210> 6
<211> 41
<212> PRT
<213> Avian influenza virus (H5N1)

<400> 6

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1 5 10 15

Ser Ser Trp Ser Ser His Glu Ala Ser Leu Gly Val Ser Ser Ala Cys
20 25 30

Pro Tyr Gln Gly Lys Ser Ser Phe Phe
35 40

<210> 7
<211> 111
<212> PRT
<213> Avian influenza virus (H5N1)

<400> 7

Leu Leu Ser Arg Ile Asn His Phe Glu Lys Ile Gln Ile Ile Pro Lys
1 5 10 15

Ser Ser Trp Ser Ser His Glu Ala Ser Leu Gly Val Ser Ser Ala Cys
20 25 30

Pro Tyr Gln Gly Lys Ser Ser Phe Phe Arg Asn Val Val Trp Leu Ile
35 40 45

Lys Lys Asn Ser Thr Tyr Pro Thr Ile Lys Arg Ser Tyr Asn Asn Thr
50 55 60

Asn Gln Glu Asp Leu Leu Val Leu Trp Gly Ile His His Pro Asn Asp
65 70 75 80

Ala Ala Glu Gln Thr Lys Leu Tyr Gln Asn Pro Thr Thr Tyr Ile Ser
85 90 95

Val Gly Thr Ser Thr Leu Asn Gln Arg Leu Val Pro Arg Ile Ala
100 105 110

<210> 8
<211> 51
<212> PRT
<213> Avian influenza virus (H5N1)
<400> 8

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1 5 10 15

His Pro Asn Asp Ala Ala Glu Gln Thr Lys Leu Tyr Gln Asn Pro Thr
20 25 30

Thr Tyr Ile Ser Val Gly Thr Ser Thr Leu Asn Gln Arg Leu Val Pro
35 40 45

Arg Ile Ala
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<210> 9
<211> 12
<212> DNA
<213> Artificial

<220>
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<400> 9
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12

<210> 10
<211> 351
<212> PRT
<213> Avian influenza virus
<400> 10

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Asp Gln Ile Cys Ile Gly Tyr His Ala Asn Asn Ser Thr Glu Gln Val
20 25 30

Asp Thr Ile Met Glu Lys Asn Val Thr Val Thr His Ala Gln Asp Ile
35 40 45

Leu Glu Lys Thr His Asn Gly Lys Leu Cys Asp Leu Asp Gly Val Lys
50 55 60

Pro Leu Ile Leu Arg Asp Cys Ser Val Ala Gly Trp Leu Leu Gly Asn
Page 6

65 70 75 80

Pro Met Cys Asp Glu Phe Ile Asn Val Pro Glu Trp Ser Tyr Ile Val
85 90 95

Glu Lys Ala Asn Pro Val Asn Asp Leu Cys Tyr Pro Gly Asp Phe Asn
100 105 110

Asp Tyr Glu Glu Leu Lys His Leu Leu Ser Arg Ile Asn His Phe Glu
115 120 125

Lys Ile Gln Ile Ile Pro Lys Ser Ser Trp Ser Ser His Glu Ala Ser
130 135 140

Leu Gly Val Ser Ser Ala Cys Pro Tyr Gln Gly Lys Ser Ser Phe Phe
145 150 155 160

Arg Asn Val Val Trp Leu Ile Lys Lys Asn Ser Thr Tyr Pro Thr Ile
165 170 175

Lys Arg Ser Tyr Asn Asn Thr Asn Gln Glu Asp Leu Leu Val Leu Trp
180 185 190

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

Asn Pro Thr Thr Tyr Ile Ser Val Gly Thr Ser Thr Leu Asn Gln Arg
210 215 220

Leu Val Pro Arg Ile Ala Thr Arg Ser Lys Val Asn Gly Gln Ser Gly
225 230 235 240

Arg Met Glu Phe Phe Trp Thr Ile Leu Lys Pro Asn Asp Ala Ile Asn
245 250 255

Phe Glu Ser Asn Gly Asn Phe Ile Ala Pro Glu Tyr Ala Tyr Lys Ile
260 265 270

Val Lys Lys Gly Asp Ser Thr Ile Met Lys Ser Glu Leu Glu Tyr Gly
275 280 285

Asn Cys Asn Thr Lys Cys Gln Thr Pro Met Gly Ala Ile Asn Ser Ser
290 295 300

Met Pro Phe His Asn Ile His Pro Leu Thr Ile Gly Glu Cys Pro Lys
305 310 315 320

Tyr Val Lys Ser Asn Arg Leu Val Leu Ala Thr Gly Leu Arg Asn Ser
325 330 335

Pro Gln Arg Glu Arg Arg Arg Lys Lys Arg Gly Leu Phe Gly Ala
340 345 350

Phoeni xTemp17731. t mp. t xt

<210> 11
 <211> 1542
 <212> DNA
 <213> Avi an i nfl uenza vi rus (H5N1)

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 agggcat ccg t t ggaagaat ggt t ggt gga at t gggaggt t t t acat aca gat gt gact 180
 gaact caaac t cagcgacca ggaaggaagg t t gat ccaga acagt at aac aat agagaga 240
 at ggt t ct ct ct gcat t t ga t gaaaggagg aacaggt acc t agaggaaca t cccagt gcg 300
 gggaaggacc cgaagaagac cggaggt cca at ct accgaa gaagagacgg gaaat ggggt g 360
 agagagct ga t t ct gt at ga caaagaggag at aaggagaa t t t ggcgcca agcgaacaat 420
 ggagaagacg caact gct gg t ct cact cac at gat gat ct ggcat t ccaa cct aaat gat 480
 gccacat acc agagaacaag agccct cgt g cggact ggaa t ggaccccag aat gt gct ct 540
 ct gat gcaag gat caaccct cccgaggaga t ct ggagct g ct ggt gcagc aat aaagga 600
 gt cgggacga t ggt aat gga act aat t cgg at gat aaagc gaggcatt aa t gaccggaac 660
 t t ct ggagag gcgagaat gg acgaagaaca aggat t gcat at gagagaat gt gcaacat c 720
 ct caaaggga aat t t caaac ggcagcacia aaagcaat ga t ggat caggt gcgagaaagc 780
 agaaat cct g ggaat gct ga aat t gaagat ct cat t t t t c t ggcacggt c t gact cat c 840
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 gccagt ggt at gat t t t ga gaggaagggt t act ct ct gg t t gggat aga t cct t t ccgt 960
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 agt caat t gg t at ggt ggc at gccat t ct gcagcat t t g aggacct gag agt ct caagt 1080
 t t cat t agag gaacaagagt aat cccaaga ggacaact at ccact agagg agt t cagat t 1140
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 at ggccgcgt t t aaggggaa t accgagggc agaact ct g acat gaggac t gaaat cat a 1380
 agaat gat gg aaagt gccag accagaagat gt gt ct t t cc aggggcgggg agt ct t cgag 1440
 ct ct cagacg aaaaggcaac gaaccgat c gt gcct t cct t t gacat gag t aat gaagga 1500
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<210> 12
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 <212> DNA
 <213> Avi an i nfl uenza vi rus (H5N1)

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Phoeni xTemp17731. t mp. t xt

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at aacaat ag	agagaat ggt	act ct ct gca	t t t gat gaaa	gaaggaacag	at acct ggaa	240
gaacacccca	gt gcgggaaa	ggacccgaag	aagact ggag	gt ccaat t t a	t cggaggaga	300
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gt caagcgaa	caat ggagag	gacgcaact g	ct ggt ct t ac	ccacct gat g	at at ggcat t	420
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cagcagt aaa	gggggt aggg	acaat ggt ga	t ggagct gat	t cggat gat a	aaacgagggga	600
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gaat gt gcaa	cat cct t aaa	gggaaat t cc	aaacagcagc	acaaagagca	at gat ggat c	720
aagt gcgaga	gagcagaaat	cct gggaat g	ct gaaat t ga	agat ct cat t	t t t ct ggcac	780
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ggggagt ct t	cgagct ct cg	gacgaaaagg	caacgaaccc	gat cgt gcct	t cct t t gaca	1440
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<210> 13

<211> 759

<212> DNA

<213> Avi an i nfl uenza vi r us (H5N1)

<400> 13

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gct ct cat gg	agt ggct aaa	gacaagacca	at cct gt cac	ct ct gact aa	agggat t t t g	180
ggat t t gt at	t cacgct cac	cgt gccaggt	gagcaggagac	t gcagcgt ag	acgct t t gt c	240
cagaat gccc	t aaat ggaaa	t ggagat cca	aat aat at gg	at agggcagt	t aagct at at	300
aagaagct ga	aaagagaaat	aacat t ccat	ggggct aagg	agggt cgcact	cagct act ca	360
accggt gcac	t t gccaggt t g	cat gggt ct c	at at acaaca	ggat gggaac	gggt gaccacg	420

Phoeni xTemp17731. t mp. t xt

gaagt ggct t t t ggccct agt gt gt gccact t gt gagcaga t t gcagat t c acagcat cgg	480
t ct cacagac agat ggcaac t at caccaac ccact aat ca gacat gagaa cagaat ggt g	540
ct ggccagca ct acagct aa ggct at ggag cagat ggcgg gat caagt ga gcaggcagcg	600
gaagccat gg agat cgct aa t caggct agg cagat ggt gc aggcaat gag gacaat t ggg	660
act cat cct a act ct agt gc t ggt ct gaga gat aat ct t c t t gaaaat t t gcaggcct ac	720
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<210> 14
 <211> 982
 <212> DNA
 <213> Avian influenza virus (H5N1)

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cagaat gccc t aaat ggaaa t ggagat cca aat aat at gg at agggcagt t aagct at at	300
aagaagct ga aaagagaaat aacat t ccat ggggct aagg aggt cgcact cagct act ca	360
accggt gcac t t gccagt t g cat ggggt ct c at at acaaca ggat gggaac ggt gaccacg	420
gaagt ggct t t t ggccct agt gt gt gccact t gt gagcaga t t gcagat t c acagcat cgg	480
t ct cacagac agat ggcaac t at caccaac ccact aat ca gacat gagaa cagaat ggt g	540
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gaagccat gg agat cgct aa t caggct agg cagat ggt gc aggcaat gag gacaat t ggg	660
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 <213> Avian influenza virus (H5N1)

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gct t cagt aa aat t agcggg caat t cat ct ct t t gcccc t t aacggat g ggct gt at ac	240
agt aaggaca acagt at aag gat cgggt t cc aagggggat g t gt t t gt t at aagagagccg	300

Phoeni xTemp17731. t mp. t xt

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