

Supplemental File 1

Alignment of Kakugo virus (KV), Deformed wing virus (DWV) and Varroa destructor virus (VDV) (by ClustalW). Aligned sequences are obtained from the honeybee official gene set release 1 available at http://genomes.arc.georgetown.edu/Amel_release1_OGS_pep.fa, which were the basis of the Mascot virus identifications (KV_mascot and DWV_mascot). In addition the most recent protein sequences of both KV (KV_Fujiyuki_2004), VDV (VDV_Ongus_2004) and DWV (DWV-Moore_2011) have been aligned in order to reveal the identity of the virus involved in this experiment. The highlighted parts are the sequences which are included in the Mascot identification, based on sequence data obtained from Maldi TOF TOF analysis. Based on current information, VP1 and VP2 are identical to DWV proteins but VP3 fits better with a KV protein. However, the DWV, KV and VDV are highly similar viruses and difficult to distinguish on the protein level. Probably they are variants of the same virus. The borders of VP1, VP2 and VP3 are indicated.

Spot 547 (identified as Kakugo virus): VP1

Spot 549 (identified as Kakugo virus): VP1

Spot 742 (identified as Deformed wing virus): VP2

Spot 813 (identified as Deformed wing virus): VP3

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KV_mascot          MAFSCGTL SYAAVAQAPSVAHAPRSWEIDEARRRRVIKRLALEQERIRNV 50
VDV_Ongus_2004    MAFSCGTL SYAAVAQAPSVAHAPRSWEIDEARRRRVIKRLALEQERIRNV 50
DWV_mascot        MAFSCGTL SYAAVAQAPSVAHAPRSWEIDEARRRRVIKRLALEQERIRNV 50
DWV-Moore_2011    MAFSCGTL SYAAVAQAPSVAHAPRSWEIDEARRRRVIKRLALEQERIRNV 50
KV_Fujiyuki_2004  MAFSCGTL SYAVTQAPSVAYAPRTWEVDEARRRRVIKRLALEQERIRNV 50
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KV_mascot          LDVTVYDHTTWEQEDARDNEFLMEQLNNLYTIYSIAERCTRRPVQEHVPI 100
VDV_Ongus_2004    LDVTVYDHTTWEQEDARDNEFLMEQLNNLYTIYSIAERCTRRPVQEHVPI 100
DWV_mascot        LDVTVYDHTTWEQEDARDNEFLTEQLNNLYTIYSIAERCTRRPVQEHVPI 100
DWV-Moore_2011    LDVTVYDHTTWEQEDARDNEFLTEQLNNLYTIYSIAERCTRRPVQEHVPI 100
KV_Fujiyuki_2004  LDVDVYNQATWEQEDVRDNEFLTEQLNNLYTIYSIAERCTRRPIKECSPI 100
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KV_mascot          SISNRYSPLESLKIEVGKDAGEFVFKKPKYTKICKKVKRVASKFVREKVV 150
VDV_Ongus_2004    SISNRYSPLESLKIEVGKDAGEFVFKKPKYTKICKKVKRVASKFVREKVV 150
DWV_mascot        SISNRYSPLESLKIEVGEDAGEFVFKKPKYTKICKKVKRVASKFVREKVV 150
DWV-Moore_2011    SISNRYSPLESLKIEVGKDAGEFVFKKPKYTKICKKVKRVASKFVREKVV 150
KV_Fujiyuki_2004  SVSNRFAPLESLKVEIGQEASECIFKKPKYTRVCKKVKRVATRFVREKVV 150
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KV_mascot RPVCNRS PMLLFKIKKVIYDLHLYRLRKQVRLLRREKQREYELECVTSL 200
VDV_Ongus_2004 RPVCNRS PMLLFKIKKVIYDLHLYRLRKQVRLLRREKQREYELECVTSL 200
DWV_mascot RPVCNRS PMLLFKIKKVIYDLHLYRLRKQVRLLRREKQREYELECVTSL 200
DWV-Moore_2011 RPVCNRS PMLLFKIKKVIYDLHLYRLRKQVRLLRREKQREYELECVTSL 200
KV_Fujiyuki_2004 RPMCPRS PMLLFKIKKVIYDLHLYRLRKQVRLLRREKQREYELECVTSL 200
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KV_mascot QLSNPVSAKPEMDNPNPGPDGEGEVELEKDSNVVLTQRPSTSI PAPT 250
VDV_Ongus_2004 QLSNPVSAKPEMDNPNPGPDGEGEVELEKDSNVVLTQRPSTSI PAPT 250
DWV_mascot QLSNPVSAKPEMDNPNPGPDGEGEVELEKDSNVVLTQRPSTSI PAPT 250
DWV-Moore_2011 QLSNPVSAKPEMDNPNPGPDGEGEVELEKDSNVVLTQRPSTSI PAPT 250
KV_Fujiyuki_2004 QLSNPVQAKPEMDNPNPGPDGEGEVELEKDSNVVLTQRPSTSI PAPT 250
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|=> VP2

KV_mascot VKWSRWTSNDVDDYATITSRWYQIAEFVWSKDDPFDKELARLILPRALL 300
VDV_Ongus_2004 VKWSRWTSNDVDDYATITSRWYQIAEFVWSKDDPFDKELARLILPRALL 300
DWV_mascot VKWSRWTSNDVDDYATITSRWYQIAEFVWSKDDPFDKELARLILPRALL 300
DWV-Moore_2011 VKWSRWTSNDVDDYATITSRWYQIAEFVWSKDDPFDKELARLILPRALL 300
KV_Fujiyuki_2004 VKWSRWTSNDVDDYATITSRWYQIAEFVWSKDDPFDKELARLILPRALL 300

KV_mascot SSIEANSDAICDVPNTIPFKVHAYWRGDMEVRVQINSNKFQVGQLQATWY 350
VDV_Ongus_2004 SSIEANSDAICDVPNTIPFKVHAYWRGDMEVRVQINSNKFQVGQLQATWY 350
DWV_mascot SSIEANSDAICDVPNTIPFKVHAYWRGDMEVRVQINSNKFQVGQLQATWY 350
DWV-Moore_2011 SSIEANSDAICDVPNTIPFKVHAYWRGDMEVRVQINSNKFQVGQLQATWY 350
KV_Fujiyuki_2004 SSIEANSDAICDVPNTIPFKVPAYWRGDMEVRVQINSNKFQVGQLQATWY 350
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KV_mascot YSDHENLNIQTKRSVYGFSHMDHALISASASNEAKLVI PFKHVYPFLPTR 400
VDV_Ongus_2004 YSDHENLNIQTKRSVYGFSHMDHALISASASNEAKLVI PFKHVYPFLPTR 400
DWV_mascot YSDHENLNIQTKRSVYGFSHMDHALISASASNEAKLVI PFKHVYPFLPTR 400
DWV-Moore_2011 YSDHENLNIQTKRSVYGFSHMDHALISASASNEAKLMI PFKHVYPFLPTR 400
KV_Fujiyuki_2004 YSDHENLNISSKRSVYGFSQMDHALISASASNEAKLVI PFKHVYPFLPTR 400
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KV_mascot VVPDWTGILDMGTLNIRVIAPLRMSATGPTTCNVVVFIKLNNSEFTGTS 450
VDV_Ongus_2004 VVPDWTGILDMGTLNIRVIAPLRMSATGPTTCNVVVFIKLNNSEFTGTS 450
DWV_mascot VVPDWTGILDMGTLNIRVIAPLRMSATGPTTCNVVVFIKLNNSEFTGTS 450
DWV-Moore_2011 VVPDWTGILDMGTLNIRVIAPLRMSATGPTTCNVVVFIKLNNSEFTGTS 450
KV_Fujiyuki_2004 IVPDWTGILDMGTLNIRVIAPLRMSATGPTTCNVVVFIKLNNSEFTGTS 450
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KV_mascot SGKFIYANQIRAKPEMDRVLNLAEGLLNNTVGGCNMDNPSYQQSPRHVFPT 500
VDV_Ongus_2004 SGKFIYANQIRAKPEMDRVLNLAEGLLNNTVGGCNMDNPSYQQSPRHVFPT 500
DWV_mascot SGKFIYANQIRAKPEMDRVLNLAEGLLNNTVGGCNMDNPSYQQSPRHVFPT 500
DWV-Moore_2011 SGKFIYANQIRAKPEMDRVLNLAEGLLNNTVGGCNMDNPSYQQSPRHVFPT 500
KV_Fujiyuki_2004 SGKFIYANQIRAKPEMDRVLNLAEGLLNNTVGGCNMDNPSYQQSPRHVFPT 500
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VP2 <=| |=> VP1

KV_mascot GMHSLALGTLNVEPLHALRLDASGTTQHPVGCAPDEDMTVSSIASRYGLI 550
VDV_Ongus_2004 GMHSLALGTLNVEPLHALRLDASGTTQHPVGCAPDEDMTVSSIASRYGLI 550
DWV_mascot GMHSLALGTLNVEPLHALRLDASGTTQHPVGCAPDEDMTVSSIASRYGLI 550
DWV-Moore_2011 GMHSLALGTLNVEPLHALRLDASGTTQHPVGCAPDEDMTVSSIASRYGLI 550
KV_Fujiyuki_2004 GMHSLALGTLNVEPLHALRLDASGTTQHPVGCAPDEDMTVSSIASRYGLI 550
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KV_mascot RQVQWKKDHAKGSLLLQLDADPFVEQKIEGTNPISLYWFAPVGVVSSMFM 600
VDV_Ongus_2004 RQVQWKKDHAKGSLLLQLDADPFVEQKIEGTNPISLYWFAPVGVVSSMFM 600
DWV_mascot RQVQWKKDHAKGSLLLQLDADPFVEQKIEGTNPISLYWFAPVGVVSSMFM 600
DWV-Moore_2011 RQVQWKKDHAKGSLLLQLDADPFVEQKIEGTNPISLYWFAPVGVVSSMFM 600
KV_Fujiyuki_2004 RQVQWKKDHAKGSLLLQLDADPFVEQKIEGTNPISLYWFAPVGVVSSMFM 600
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KV_mascot QWRGSLEYRFDIIASQFHTGRLIVGYVPGLTASLQRQMDYMKLKSSSYV 650
VDV_Ongus_2004 QWRGSLEYRFDIIASQFHTGRLIVGYVPGLTASLQRQMDYMKLKSSSYV 650
DWV_mascot QWRGSLEYRFDIIASQFHTGRLIVGYVPGLTASLQRQMDYMKLKSSSYV 650
DWV-Moore_2011 QWRGSLEYRFDIIASQFHTGRLIVGYVPGLTASLQRQMDYMKLKSSSYV 650
KV_Fujiyuki_2004 QWRGSLEYRFDIIASQFHTGRLIVGYVPGLTASLQRQMDYMKLKSSSYV 650
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KV_mascot FDLQESNSFTFEVPYVSYRPWWVRKYGGNYLPSSTDAPSTLFMYVQVPLI 700
VDV_Ongus_2004 FDLQESNSFTFEVPYVSYRPWWVRKYGGNYLPSSTDAPSTLFMYVQVPLI 700
D WV_mascot FDLQESNSFTFEVPYVSYRPWWVRKYGGNYLPSSTDAPSTLFMYVQVPLI 700
D WV-Moore_2011 FDLQESNSFTFEVPYVSYRPWWVRKYGGNYLPSSTDAPSTLFMYVQVPLI 700
KV_Fujiyuki_2004 FDLQESNSFTFEVPYVSYRPWWVRKYGGNYLPSSTDAPSTLFMYVQVPLI 700

KV_mascot PMEAVSDTIDINVYVRGGSSFVFCVPVQPSLGLNWNTDFILRNDEEYRAK 750
VDV_Ongus_2004 PMEAVSDTIDINVYVRGGSSFVFCVPVQPSLGLNWNTDFILRNDEEYRAK 750
D WV_mascot PMEAVSDTIDINVYVRGGSSFVFCVPVQPSLGLNWNTDFILRNDEEYRAK 750
D WV-Moore_2011 PMEAVSDTIDINVYVRGGSSFVFCVPVQPSLGLNWNTDFILRNDEEYRAK 750
KV_Fujiyuki_2004 PMEAVSDTIDINVYVRGGSSFVFCVPVQPSLGLNWNTDFILRNDEEYRAK 750

KV_mascot NGYAPYYAGVWHSFNNSNSLVFRWGSASDQIAQWPTITVPRGELAFRLIR 800
VDV_Ongus_2004 NGYAPYYAGVWHSFNNSNSLVFRWGSASDQIAQWPTITVPRGELAFRLIR 800
D WV_mascot NGYAPYYAGVWHSFNNSNSLVFRWGSASDQIAQWPTITVPRGELAFRLIR 800
D WV-Moore_2011 NGYAPYYAGVWHSFNNSNSLVFRWGSASDQIAQWPTITVPRGELAFRLIR 800
KV_Fujiyuki_2004 TGYAPYYAGVWHSFNNSNSLVFRWGSASDQIAQWPTITVPRGELAFRLIX 800
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KV_mascot DAKQAAVGTQPWRTM VVWPSGHGYNIGIPTYNAERARQLAQHLYGGGSLT 850
VDV_Ongus_2004 DAKQAAVGTQPWRTM VVWPSGHGYNIGIPTYNAERARQLAQHLYGGGSLT 850
D WV_mascot DAKQAAVGTQPWRTM VVWPSGHGYNIGIPTYNAERARQLAQHLYGGGSLT 850
D WV-Moore_2011 DAKQAAVGTQPWRTM VVWPSGHGYNIGIPTYNAERARQLAQHLYGGGSLT 850
KV_Fujiyuki_2004 DGKQAAVGTQPWRTM VVWPSGHGYNIGIPTYNAERARQLAQHLYGGGSLT 850
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KV_mascot DEKAKQLFVPANQQGPGKVSNGNPVWEVMRAPLATQQAHIQDFEFVEAVP 900
VDV_Ongus_2004 DEKAKQLFVPANQQGPGKVSNGNPVWEVMRAPLATQQAHIQDFEFVEAVP 900
D WV_mascot DEKAKQLFVPANQQGPGKVSNGNPVWEVMRAPLATQQAHIQDFEFVEAVP 900
D WV-Moore_2011 DEKAKQLFVPANQQGPGKVSNGNPVWEVMRAPLATQQAHIQDFEFVEAVP 900
KV_Fujiyuki_2004 DEKAKQLFVPANQQGPGKVSNGNPVWEVMRAPLATQRAHVQDFEFIEAIP 900
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KV_mascot EGEESRNTTVLDTTTTLQSSGFGRAFFGEAFNDLKTLMRRYQLYGQLLS 950
VDV_Ongus_2004 EGEESRNTTVLDTTTTLQSSGFGRAFFGEAFNDLKTLMRRYQLYGQLLS 950
DWV_mascot EGEESRNTTVLDTTTTLQSSGFGRAFFGEAFNDLKTLMRRYQLYGQLLS 950
DWV-Moore_2011 EGEESRNTTVLDTTTTLQSSGFGRAFFGEAFNDLKTLMRRYQLYGQLLS 950
KV_Fujiyuki_2004 EGEESRNTTVLDTTTTLQSSGFGRAFFGEAFNDLKTLMRRYQLYGQLLS 950

VP1 <|=> VP3

KV_mascot VTTDKIDIDHCMFTFPCLPQGLALDIGSAGSPHEIFNRCRDGIIPLIASGY 1000
VDV_Ongus_2004 VTTDKIDIDHCMFTFPCLPQGLALDIGSAGSPHEIFNRCRDGIIPLIASGY 1000
DWV_mascot VTTDKIDIDHCMFTFPCLPQGLALDIGSAGSPHEIFNRCRDGIIPLIASGY 1000
DWV-Moore_2011 VTTDKIDIDHCMFTFPCLPQGLALDIGSAGSPHEIFNRCRDGIIPLIASGY 1000
KV_Fujiyuki_2004 VTTDKIDIDHCMFTFPCLPQGLALDIGSAGSPHEIFNRCRDGIIPLIASGY 1000

KV_mascot RFYRGDLRFKIVFPSNVNSNIWVQHRPDRRLKGWSEAKIVNCDAVSTGQG 1050
VDV_Ongus_2004 RFYRGDLRFKIVFPSNVNSNIWVQHRPDRRLKGWSEAKIVNCDAVSTGQG 1050
DWV_mascot RFYRGDLRFKIVFPSNVNSNIWVQHRPDRRLKGWSEAKIVNCDAVSTGQG 1050
DWV-Moore_2011 RFYRGDLRFKIVFPSNVNSNIWVQHRPDRRLKGWSEAKIVNCDAVSTGQG 1050
KV_Fujiyuki_2004 RFYRGDLRYKIVFPSNVNSNIWVQHRPDRRLKGWSEAKIVNCDAVSTGQG 1050

KV_mascot VYNHGYASHIQITRVNNVIELEVPFYNATCYNLQAFNPSSAASSYAVSL 1100
VDV_Ongus_2004 VYNHGYASHIQITRVNNVIELEVPFYNATCYNLQAFNPSSAASSYAVSL 1100
DWV_mascot VYNHGYASHIQITRVNNVIELEVPFYNATCYNLQAFNPSSAASSYAVSL 1100
DWV-Moore_2011 VYNHGYASHIQITRVNNVIELEVPFYNATCYNLQAFNPSSAASSYAVSL 1100
KV_Fujiyuki_2004 VYNHGYASHIQITRVNNVIELEVPFYNATCYNLQAFNPSSAASSYAVSL 1100

KV_mascot GEISVGFQATSDDIAAIVNKPVTIYYSIGDGMQFSQWVGYPMMILDQLP 1150
VDV_Ongus_2004 GEISVGFQATSDDIAAIVNKPVTIYYSIGDGMQFSQWVGYPMMILDQLP 1150
DWV_mascot GEISVGFQATSDDIAAIVNKPVTIYYSIGDGMQFSQWVGYPMMILDQLP 1150
DWV-Moore_2011 GEISVGFQATSDDIAAIVNKPVTIYYSIGDGMQFSQWVGYPMMILDQLP 1150
KV_Fujiyuki_2004 GEISVGFQATSDDIASIVNKPVTIYYSIGDGMQFSQWVGYPMMILDQLP 1150

KV_mascot APVVRVAVPEGPIAKIKNFFHQTADEVREAQAAKMREDMGIVVQDVIGELS 1200
VDV_Ongus_2004 APVVRVAVPEGPIAKIKNFFHQTADEVREAQAAKMREDMGIVVQDVIGELS 1200
DWV_mascot APVVRVAVPEGPIAKIKNFFHQTADEVREAQAAKMREDMGIVVQDVIGELS 1200
DWV-Moore_2011 APVVRVAVPEGPIAKIKNFFHQTADEVREAQAAKMREDMGIVVQDVIGELS 1200
KV_Fujiyuki_2004 APVVRVAVPEGPIAKIKNFFHQTADEVREAQAAKMREDMGIVVQDVIGELS 1200
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VP3 <=|

KV_mascot QAI PDLQQPEVQANVFSLSQLVHAIIGTSLKTVAWAIVSIFVTLGLIGR 1250
VDV_Ongus_2004 QAI PDLQQPEVQANVFSLSQLVHAIIGTSLKTVAWAIVSIFVTLGLIGR 1250
DWV_mascot QAI PDLQQPEVQANVFSLSQLVHAIIGTSLKTVAWAIVSIFVTLGLIGR 1250
DWV-Moore_2011 QAI PDLQQPEVQANVFSLSQLVHAIIGTSLKTVAWAIVSIFVTLGLIGR 1250
KV_Fujiyuki_2004 QAI PDLQQPEVQANVFSLSQLVHAIIGTSLKTVAWAIVSIFVTLGLIGR 1250

KV_mascot EMMHSVITVVKRLLLEKYHLATQPQESANS GTVISAIPEAPNAEAE EASAW 1300
VDV_Ongus_2004 EMMHSVITVVKRLLLEKYHLATQPQESANS GTVISAIPEAPNAEAE EASAW 1300
DWV_mascot EMMHSVITVVKRLLLEKYHLATQPQESANS GTVISAVPEAPNAEAE EASAW 1300
DWV-Moore_2011 EMMHSVITVVKRLLLEKYHLATQPQESANS GTVISAVPEAPNAEAE EASAW 1300
KV_Fujiyuki_2004 EMMHSVITVVKRLLLEKYHLATQPQESANS STVISAVPEAPNAEAE EASAW 1300
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KV_mascot VSIIYNGVCNMLNVAAQPKQFKDWV KLATVDFSN NCRGSNQVFVFFKNT 1350
VDV_Ongus_2004 VSIIYNGVCNMLNVAAQPKQFKDWV KLATVDFSN NCRGSNQVFVFFKNT 1350
DWV_mascot VSIIYNGVCNMLNVAAQPKQFKDWV KLATVDFSN NCRGSNQVFVFFKNT 1350
DWV-Moore_2011 VSIIYNGVCNMLNVAAQPKQFKDWV KLATVDFSN NCRGSNQVFVFFKNT 1350
KV_Fujiyuki_2004 VSIIYNGVCNMLNVAAQPKQFKDWV KLATVDFSN NCRGSNQVFVFFKNT 1350

KV_mascot FEVLKMMWGYVFCQSNPAARLLKAVNDEPEILKAWVKECLYLDDPKFRMR 1400
VDV_Ongus_2004 FEVLKMMWGYVFCQSNPAARLLKAVNDEPEILKAWVKECLYLDDPKFRMR 1400
DWV_mascot FEVLKMMWGYVFCQSNPAARLLKAVNDEPEILKAWVKECLYLDDPKFRMR 1400
DWV-Moore_2011 FEVLKMMWGYVFCQSNPAARLLKAVNDEPEILKAWVKECLYLDDPKFRMR 1400
KV_Fujiyuki_2004 FEVLKMMWGYVFCQSNPAARLLKAVNDEPEILKAWVKECLYLDDPKFRMR 1400

KV_mascot RAHDQEYIERVFAAHSYGQILLHDLTAEMNQSRNLSVFTRVYDQISKLKT 1450
VDV_Ongus_2004 RAHDQEYIERVFAAHSYGQILLHDLTAEMNQSRNLSVFTRVYDQISKLKT 1450
DWV_mascot RAHDQEYIERVFAAHSYGQILLHDLTAEMNQSRNLSVFTRVYDQISKLKT 1450
DWV-Moore_2011 RAHDQEYIERVFAAHSYGQILLHDLTAEMNQSRNLSVFTRVYDQISKLKT 1450
KV_Fujiyuki_2004 RAHDQEYIERVFAAHSYGQILLHDLTAEMNQSRNLSVFTRVYDQISKLKT 1450

KV_mascot DLMEMGSNPYIRRECF TICMGASGIGKSYLTDSLCSELLRASRTPVTTG 1500
VDV_Ongus_2004 DLMEMGSNPYIRRECF TICMGASGIGKSYLTDSLCSELLRASRTPVTTG 1500
DWV_mascot DLMEMGSNPYIRRECF TICMGASGIGKSYLTDSLCSELLRASRTPVTTG 1500
DWV-Moore_2011 DLMEMGSNPYIRRECF TICMGASGIGKSYLTDSLCSELLRASRTPVTTG 1500
KV_Fujiyuki_2004 DLMEMGSNPYIRRECF TICMGASGIGKSYLTDSLCSELLRASRTPVTTG 1500

KV_mascot IKCVVNPLSDYWDQCFQPVLCVDDMWSVETSTTLDKQLNMLFQVHSPIV 1550
VDV_Ongus_2004 IKCVVNPLSDYWDQCFQPVLCVDDMWSVETSTTLDKQLNMLFQVHSPIV 1550
DWV_mascot IKCVVNPLSDYWDQCFQPVLCVDDMWSVETSTTLDKQLNMLFQVHSPIV 1550
DWV-Moore_2011 IKCVVNPLSDYWDQCFQPVLCVDDMWSVETSTTLDKQLNMLFQVHSPIV 1550
KV_Fujiyuki_2004 IKCVVNPLSDYWDQCFQPVLCVDDMWSVETSTTLDKQLNMLFQVHSPIV 1550

KV_mascot LSPPKADLEGKKMRYNPEIFIYNTNKPFPRFDRIAMEAIYRRRNVLIECK 1600
VDV_Ongus_2004 LSPPKADLEGKKMRYNPEIFIYNTNKPFPRFDRIAMEAIYRRRNVLIECK 1600
DWV_mascot LSPPKADLEGKKMRYNPEIFIYNTNKPFPRFDRIAMEAIYRRRNVLIECK 1600
DWV-Moore_2011 LSPPKADLEGKKMRYNPEIFIYNTNKPFPRFDRIAMEAIYRRRNVLIECK 1600
KV_Fujiyuki_2004 LSPPKADLEGKKMRYNPEIFIYNTNKPFPRFDRIAMEAIYRRRNVLIECK 1600

KV_mascot ANEEKKRGCKHCENNIPIAECSPKILKDFHHIKFRYAHDVCNSETTWSEW 1650
VDV_Ongus_2004 ANEEKKRGCKHCENNIPIAECSPKILKDFHHIKFRYAHDVCNSETTWSEW 1650
DWV_mascot ASEEKRGCKHCEDDIPIAECSPKMLKDFHHIKFRYAHDVCNSETTWSEW 1650
DWV-Moore_2011 ASEEKRGCKHCENDIPIAECSPKMLQDFHHIKFRYAHDVCNSETTWSEW 1650
KV_Fujiyuki_2004 ASEEKRGCKHCENDIPIAECSPKMLKDFHHIKFRYAHDVCNSETTWSEW 1650
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KV_mascot MSYNEFLEWITPVYMANRRKANESFKMRVDEMQLRMDEPLEGDNILNKY 1700
VDV_Ongus_2004 MSYNEFLEWITPVYMANRRKANESFKMRVDEMQLRMDEPLEGDNILNKY 1700
DWV_mascot MTYNEFLEWITPVYMANRRKANESFKMRVDEMQLRMDEPLEGDNILNKY 1700
DWV-Moore_2011 MTYSEFLEWITPVYMANRRKANESFKMRVDEMQLRMDEPLEGDNILNKY 1700
KV_Fujiyuki_2004 MTYNEFLEWITPVYMANRRKANESFKMRVDEMQLRMDEPLEGDNILNKY 1700

KV_mascot VEVNQRLVEEMKAFKERTLWADLQRVGSEISTSVKKALPTISITEKLPHW 1750
VDV_Ongus_2004 VEVNQRLVEEMKAFKERTLWADLQRVGSEISTSVKKALPTISITEKLPHW 1750
DWV_mascot VEVNQRLVEEMKAFKERTLWSDLHRVGAEISASVKKALPTISITEKLPHW 1750
DWV-Moore_2011 VEVNQRLVEEMKAFKERTLWSDLHRVGAEISASVKKALPTISITEKLPHW 1750
KV_Fujiyuki_2004 VEVNQRLVEEMKAFKERTLWSDLHRVGAEISASVKKALPTISITEKLPHW 1750
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KV_mascot TIQCGIAKPEMDHAYEVMSSYAAGMNAEIEAHEQVRRSSLECQYIEPSTS 1800
VDV_Ongus_2004 TIQCGIAKPEMDHAYEVMSSYAAGMNAEIEAHEQVRRSSLECQYIEPSTS 1800
DWV_mascot TVQCGIAKPEMDHAYEVMSSYAAGMNAEIEAHEQVRRSSVEC----- 1792
DWV-Moore_2011 TVQCGIAKPEMDHAYEVMSSYAAGMNAEIEAHEQVRRSSVECQYAEPQAS 1800
KV_Fujiyuki_2004 TVQCGIAKPEMDHAYEVMSSYAAGMNAEIEAHEQVRRSSVECQYAEPQAP 1800
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KV_mascot RPLDEEGPTIDEELLGEVEFTSSALERLVDEGYITGKQKKYMATWCTKRR 1850
VDV_Ongus_2004 RPLDEEGPTIDEELLGEVEFTSSALERLVDEGYITGKQKKYMATWCTKRR 1850
DWV_mascot -----
DWV-Moore_2011 RNPDEEGPTIDEELMGDTEFTSQALERLVDEGYITGKQKKYIATWCSKRR 1850
KV_Fujiyuki_2004 RNPDEEGPTIDEELMGDTEFTSQALERLVDEGYITGKQKKYIATWCSKRR 1850

KV_mascot EHVSDFDLVWTDNLRVLSAYVHERSTSTRLSTDDVKLFKTI SMLHQRYDT 1900
VDV_Ongus_2004 EHVSDFDLVWTDNLRVLSAYVHERSTSTRLSTDDVKLFKTI SMLHQRYDT 1900
DWV_mascot -----
DWV-Moore_2011 EHTADFDLVWTDNLRVLSAYAHERSSTRLSTDDVKLYKTI SMLHQKYDT 1900
KV_Fujiyuki_2004 EHTADFDLVWTDNLRVLSAYVHERSASTRLSTDDVKLYKTI SMLHQKYDT 1900

KV_mascot TDCAKCQHWYAPLTAIYVDDRKLFWCQKETKTLDVRKLSKEDVTVQSKL 1950
VDV_Ongus_2004 TDCAKCQHWYAPLTAIYVDDRKLFWCQKETKTLDVRKLSKEDVTVQSKL 1950
DWV_mascot -----
DWV-Moore_2011 TECAKCQHWYAPLTDIYVDDKKLFWCQKEKKTLDVRKLSKEDVTVQSKL 1950
KV_Fujiyuki_2004 TECAKCQHWYAPLTDIYVDDKKLFWCQKEKKTLDVRKLSKEDVTVQSKL 1950

KV_mascot INLSVPCGDVCMHLSKYFNLYL FHKAWLFENPTWRLIYNGTKKGMPEYFMN 2000
VDV_Ongus_2004 INLSVPCGDVCMHLSKYFNLYL FHKAWLFENPTWRLIYNGTKKGMPEYFMN 2000
DWV_mascot -----
DWV-Moore_2011 INLSVPCGEVCMHLSKYFNLYL FHKAWLFENPTWRLIYNGTKKGMPEYFMN 2000
KV_Fujiyuki_2004 INLSVPCGEVCMHLSKYFNLYL FHKAWLFENPTWRLIYNGTKKGMPEYFMN 2000

KV_mascot CVDEISLDSKFKVKVWLQAIIDKYLTRPVKMIRDFLFKWWPQVAYVLSL 2050
VDV_Ongus_2004 CVDEISLDSKFKVKVWLQAIIDKYLTRPVKMIRDFLFKWWPQVAYVLSL 2050
DWV_mascot -----
DWV-Moore_2011 CVDEISLDSKFGKVKVWLQAIIDKYLTRPVKMIRDFLFKWWPQVAYVLSL 2050
KV_Fujiyuki_2004 CVDEISLDSKFGKVKVWLQAIIDKYLTRPVKMIRDFLFKWWPQVAYVLSL 2050

KV_mascot LGIIGITAYEMRNPKSTAEDLAEHYVNRHCSSDFWSPGMATPQGLKYSEA 2100
VDV_Ongus_2004 LGIIGITAYEMRNPKSTAEDLAEHYVNRHCSSDFWSPGMATPQGLKYSEA 2100
DWV_mascot -----
DWV-Moore_2011 LGIIGITAYEMRNPKPTSEELADHYVNRHCSSDFWSPGLASPQGLKYSEA 2100
KV_Fujiyuki_2004 LGIIGITAYEMRNPKPTSEQLADHYVNRHCSSDFWSPGLASPQGLKYSEA 2100

KV_mascot ITAKAPRIHRLPVTTRPQGSTQQVDAAVNKILQNMVYIGVVFPKVPKPGSKW 2150
VDV_Ongus_2004 ITAKAPRIHRLPVTTRPQGSTQQVDAAVNKILQNMVYIGVVFPKVPKPGSKW 2150
DWV_mascot -----
DWV-Moore_2011 VTAKAPRIHRLPVTTKPQGSTQQVDAAVNKILQNMVYIGVVFPKVPKPGSKW 2150
KV_Fujiyuki_2004 VTAKAPRIHRLPVTTKPQGSTQQVDAAVNKILQNMVYIGVVFPKVPKPGSKW 2150

KV_mascot RDINFRCLMLHNRQCLMLRHYIESTAAPPEGTKYYFKYIHNQETRMSGDI 2200
VDV_Ongus_2004 RDINFRCLMLHNRQCLMLRHYIESTAAPPEGTKYYFKYIHNQETRMSGDI 2200
DWV_mascot -----
DWV-Moore_2011 RDINFRCLMLHNRQCLMLRHYIESTAAPPEGTKYYFKYIHNQETRMSGDI 2200
KV_Fujiyuki_2004 RDINFRCLMLHNRQCLMLRHYIESTAAPPEGTKYYFKYIHNQETRMSGDI 2200

KV_mascot SGIEIDLLSLPRLYYGGLAGEESFDSNIVLVTMPNRIPECKSIVKFIASH 2250
VDV_Ongus_2004 SGIEIDLLSLPRLYYGGLAGEESFDSNIVLVTMPNRIPECKSIVKFIASH 2250
DWV_mascot -----
DWV-Moore_2011 SGIEIDLLNLPRLYYGGLAGEESFDSNIVLVTMPNRIPECKSIIKFIASH 2250
KV_Fujiyuki_2004 SGIEIDLLNLPRLYYGGLAGEESFDSNIVLVTMPNRIPECKSIIKFIASH 2250

KV_mascot AEHARAQNDGVLVTGEHTQLLAFENNNKTPISINADGLYEIVLQGVYTYTYP 2300
VDV_Ongus_2004 AEHARAQNDGVLVTGEHTQLLAFENNNKTPISINADGLYEIVLQGVYTYTYP 2300
DWV_mascot -----
DWV-Moore_2011 NEHIRAQNDGVLVTGDHTQLLAFENNNKTPISINADGLYEIVLQGVYTYTYP 2300
KV_Fujiyuki_2004 NEHIRAQNDGVLVTGDHTQLLAFENNNKTPISINADGLYEIVLQGVYTYTYP 2300

KV_mascot YHGDGVCGSILLSRNLQRPIIGIHVAGTEGLHGFGVAEPLVHEMFTGKAI 2350
VDV_Ongus_2004 YHGDGVCGSILLSRNLQRPIIGIHVAGTEGLHGFGVAEPLVHEMFTGKAI 2350
DWV_mascot -----
DWV-Moore_2011 YHGDGVCGSILLSRNLQRPIIGIHVAGTEGLHGFGVAEPLVHEMFTGKAI 2350
KV_Fujiyuki_2004 YHGDGVCGSILLSRNLQRPIIGIHVAGTEGLHGFGVAEPLVHEMFTGKAI 2350

KV_mascot ESEREPYDRVYELPLRELEDESIGLDTDLYPIGRVDAKLAHAQSPSTGIK 2400
VDV_Ongus_2004 ESEREPYDRVYELPLRELEDESIGLDTDLYPIGRVDAKLAHAQSPSTGIK 2400
DWV_mascot -----
DWV-Moore_2011 ESEREPYDRVYELPLRELEDESIGLDTDLYPIGRVDAKLAHAQSPSTGIK 2400
KV_Fujiyuki_2004 ESEREPYDRVYELPLRELEDESIGLDTDLYPIGRVDAKLAHAQSPSTGIK 2400

KV_mascot KTLIHGTFDVTWTEPNPMSRDPRIAPHDPLKLGCEKHGMPCSPFNKXLE 2450
VDV_Ongus_2004 KTLIHGTFDVTWTEPNPMSRDPRIAPHDPLKLGCEKHGMPCSPFNKXLE 2450
DWV_mascot -----
DWV-Moore_2011 KTLIHGTFDVRTEPNPMSRDPRIAPHDPLKLGCEKHGMPCSPFNKXLE 2450
KV_Fujiyuki_2004 KTLIHGTFDVRTEPNPMSRDPRIAPHDPLKLGCEKHGMPCSPFNKXLE 2450

KV_mascot LATTHLKEKLISVVKPINGCKIRSLQDAVCGVPGLDGFDSISWNTSAGFP 2500
VDV_Ongus_2004 LATTHLKEKLISVVKPINGCKIRSLQDAVCGVPGLDGFDSISWNTSAGFP 2500
DWV_mascot -----
DWV-Moore_2011 LATNHLKEKLVSVVKPINGCKIRSLQDAVCGVPGLDGFDSISWNTSAGFP 2500
KV_Fujiyuki_2004 LATNHLKEKLVSVVKPINGCKIRSLQDAVCGVPGLDGFDSISWNTSAGFP 2500

KV_mascot LSSLKPPGSSGKRWLFDIELQDSGCYLLRGMRPELEIQLTSTQLMRKKGM 2550
VDV_Ongus_2004 LSSLKPPGSSGKRWLFDIELQDSGCYLLRGMRPELEIQLTSTQLMRKKGM 2550
DWV_mascot -----
DWV-Moore_2011 LSSLKPPGTSGKRWLFDIELQDSGCYLLRGMRPELEIQLTSTQLMRKKGI 2550
KV_Fujiyuki_2004 LSSLKPPGASGKRWLFDIELQDSGCYLLRGMRPELEIQLTSTQLMRKKGI 2550

KV_mascot KPHTIFTDCLKDTCLPVEKCRIPGKTRIFSI SPVQFTIPFRQYYLDFMAS 2600
VDV_Ongus_2004 KPHTIFTDCLKDTCLPVEKCRIPGKTRIFSI SPVQFTIPFRQYYLDFMAS 2600
DWV_mascot -----
DWV-Moore_2011 KPHTIFTDCLKDTCLPVEKCRIPGKTRIFSI SPVQFTIPFRQYYLDFMAS 2600
KV_Fujiyuki_2004 KPHTIFTDCLKDTCLPVEKCRIPGKTRIFSI SPVQFTIPFRQYYLDFMAS 2600

KV_mascot YRAARLNAEHGIGIDVNSLEWTNLATSLSKYGTHIVTG DYKNFGPGLDSD 2650
VDV_Ongus_2004 YRAARLNAEHGIGIDVNSLEWTNLATSLSKYGTHIVTG DYKNFGPGLDSD 2650
D WV_mascot -----
D WV-Moore_2011 YRAARLNAEHGIGIDVNSLEWTNLATRLSKYGTHIVTG DYKNFGPGLDSD 2650
KV_Fujiyuki_2004 YRAARLNAEHGIGIDVNSLEWTNLATSLSKYGTHIVTG DYKNFGPGLDSD 2650

KV_mascot VAASAFEIIIDWVLNYTEEDDKDEMKRVMWTMAQEILAPSHLCRDLVYRV 2700
VDV_Ongus_2004 VAASAFEIIIDWVLNYTEEDDKDEMKRVMWTMAQEILAPSHLCRDLVYRV 2700
D WV_mascot -----
D WV-Moore_2011 VAASAFEIIIDWVLHYTEEDNKDEMKRVMWTMAQEILAPSHLCRDLVYRV 2700
KV_Fujiyuki_2004 VAASAFEIIIDWVLHYTEEDNKDEMKRVMWTMAQEILAPSHLCRDLVYRV 2700

KV_mascot PCGIPSGSPITDILNTISNCLLIRLAWQGITDLPLSEFSRHVVLV CYGDD 2750
VDV_Ongus_2004 PCGIPSGSPITDILNTISNCLLIRLAWQGITDLPLSEFSRHVVLV CYGDD 2750
D WV_mascot -----
D WV-Moore_2011 PCGIPSGSPITDILNTISNCLLIRLAWLGITDLPLSEFSQNVVLV CYGDD 2750
KV_Fujiyuki_2004 PCGIPSGSPITDILNTISNCLLIRLAWLGITDLPLSEFSQNVVLV CYGDD 2750

KV_mascot LIMNVSDEMIDKFNAVTIGDFFSRYKMEFTDQDKSGNTVVRWRTLQTATFL 2800
VDV_Ongus_2004 LIMNVSDEMIDKFNAVTIGDFFSRYKMEFTDQDKSGNTVVRWRTLQTATFL 2800
D WV_mascot -----
D WV-Moore_2011 LIMNVSDNMIDKFNAVTIGKFFS QYKMEFTDQDKSGNTVKWRTLQTATFL 2800
KV_Fujiyuki_2004 LIMNVSDNMIDKFNAVTIGKFFS QYEMVFTDQDKSGNTVKWRTLQTATFL 2800

KV_mascot KHGFLKHPTRPVFLANLDKVSIEGTTNWTHARGLGRRVATIENAKQALEL 2850
VDV_Ongus_2004 KHGFLKHPTRPVFLANLDKVSIEGTTNWTHARGLGRRVATIENAKQALEL 2850
D WV_mascot -----
D WV-Moore_2011 KHGFLKHPTRPVFLANLDKVSVEGTTNWTHARGLGRRTATIENAKQALEL 2850
KV_Fujiyuki_2004 KHGFLKHPTRPVFLANLDKVSVEGTTNWTHARGLGRRATIENAKQALEL 2850

KV_mascot AFGWGPEYFNHVRNTIKMAFDKLG IYEDLITWEEMDVRCYASA 2893
VDV_Ongus_2004 AFGWGPEYFNHVRNTIKMAFDKLG IYEDLITWEEMDVRCYASA 2893
D WV_mascot -----
D WV-Moore_2011 AFGWGPEYFN YVRNTIKMAFDKLG IYEDLITWEEMDVRCYASA 2893
KV_Fujiyuki_2004 AFGWGPEYFN YVRNTIKMAFDKLG IYEDLITWEEMDVRCYASA 2893

