

A. caninum NPR-1 VGGIQAI^IGLFIGT^FSLCAIA^IDRY^FRLV^IAPGSP^LLRK^VNAIR^IITILL^WI^ISI^LATLPY^VVYHMK^KKKYP^AIN⁻VCGE^FCTEK^WPNVH^SKR^LIY^TLF^VLAI^QF
H. contortus NPR-1 VGGIQAI^IGLFIGT^FSLCAIA^IDRY^FRLV^IAPGSP^LLRK^VNAIR^IITILL^WI^ISI^LATLPY^VVYHMK^KKKYP^TISD⁻VCGE^FCTEK^WPNVH^SKR^LIY^TLF^VLAI^QF
C. elegans NPR-1 IFCIQGIS^IIFV^CTFSL^GAIAL^DRYIL^VVR^PHSTP^LLSQ^RGAF^LTLV^LLL^ILS^FV^TLPYAF^NMQ^IEY^TEE⁻R^ICGY^FCTEK^WESAK^SRR^AYT^MI^VML^AQ^F
N. brasiliensis NPR-1 VGGIQAI^IGLFIGT^FSLCAIA^IDRY^FRLV^IAPGSP^LLRK^VNAIR^IITILL^WI^ISI^LATLPY^VVYHMK^KRRK^YPSIN⁻VCGE^FCTEK^WPNVH^SKR^LIY^TLF^VLAI^QF
S. ratti NPR-1.1 IALIQG^VSI^IY^ICTF^SLGAIA^VDRY^ILV^KPHS^ALSR^KGGALV^TGIL^WTL^SL^IFN^IIPY^VLFMY^IQSY^FKG⁻VCGV^FCTEK^WPNPES^RRAY^TLM^VMA^QF
S. ratti NPR-1.2 SGSI^OGIG^IF^IST^YSLCAIA^IDRY^RLV^ESPK^TSL^TK^IQA^IFA^TLT^IW^IIS^FI^IFPY^IYNM^KI^VTY^NN⁻ICG^YFCTE^DWD^NDKH^RQ^IY^TII^IFF^VQ^G

Consensus LP IQGIAVFIGT^FSLCAIA^VDRY^IIMV^LLP R L K A ITIILW^TLSII^STLPY^A Y M L Y G ICG FCTE WPN R IY^TLF^V VV^QF

B. malayi NPR-1 -----
W. bancrofti NPR-1 -----RIKER^SMA^MASAG^LVENP^NNNV^LDCKR⁻-----NFGSN⁻-----AFKEN^HT
D. immitis NPR-1 IIP^LTI^MF^ICY^YH^IFA^ELR^KR^TTSK^KIM^T-----
O. volvulus NPR-1 IIP^LTI^MF^ICY^YQ^IFA^ELR^KR^TTSK^KIM^RIKER^SSV^VMT^SGG^LSVEN^ADN^LLD^CNR⁻-----ISD^NDAF^QEN^Q-----
O. ochengi NPR-1 IIP^LTI^MF^ICY^YQ^IFA^ELR^KR^TTSK^KIM^RIKER^SSV^VMA^SAG^LSVEN^ADN^LLD^CNR⁻-----ISD^NDAF^QEN^Q-----R^NEL^VAN^ARR^NT
L. loa NPR-1 VIPL^ITI^MF^ICY^RIF^AK^LR^KR^TTSK^KIM^RIKER^SMA^MASAG^LLEN^PNNM^LDCKR⁻-----NFD^GDNDF^KEN^QDR^LEN^ELLAN^ARR^NT
A. suum NPR-1 VIP^FTI^MVAF^CYAV^IFAR^LR^TAR^LR^LQ^RINER^CSF^VLEK^TNSP^SSMR^HPR^FKAV⁻-----SSE^IS^DIC^MTQ^EKV^RHH^LLK^QTR^RTT
A. caninum NPR-1 VIP^FTI^MTI^CYQAV^FSLRR^RAK^SRL^TSIA^QQAN^LLYV^VAATAG^GDTQ^HKE^QL^T-----HLIE^QK^RRV^LQ^RRR^VT
H. contortus NPR-1 VIP^FTI^MTI^CYQAV^FSLRR^RAK^SRL^TSIA^QQAN^LLYV^VAATAG^GDTQ^HKE^Q-----LTH^LIE^QK^RRV^MQ^RRR^VT
C. elegans NPR-1 VV^PFA^VVAF^CYAN^IV^SVL^SKRA^QT^KIR^KM^VERT^SA^LESS^CAF^PSH^GLE^QYEN^L-----NEFL^DK^QE^KE^KQ^RV^VL^ONR^RTT
N. brasiliensis NPR-1 IIP^FTI^MTI^CYQAV^FSLRR^RAK^SRL^TSIA^QQAN^LLYV^VAATAG^GDTQ^HKE^QL^T-----HLFE^QK^RRV^TQ^RRR^VT
S. ratti NPR-1.1 VFP^FSV^MVAF^CYAT^LFS^KL^SRA^KL^RIR^KIDER^FV^ALGR^SSNY^TNI^SEHL^AMET^DNK^TCV^VLST^LTL^TV^TNN^IE^ISK^GNV^PT^LAL^QE^KD^KQ^RLL^NQ^TRR^NT
S. ratti NPR-1.2 IIP^FCI^ITI^CYQ^IFA^KL^HK^RAN^FK^LLS^TS^QQV^NLL^SV^LTNT^VTC^IE^KKK^RIE^IQ⁻-----KKK^IT

Consensus VIP^FTI^M I^CY I^FA L^RK^R K^I R^I E^R L K L^L Q^R R^R T

B. malayi NPR-1 -----
W. bancrofti NPR-1 IIL^VSM^VV^LF^AV^SW^LPH^NI^VS^LLM^EF^DES⁻----L^FER^HD^GV^NSI^YL^IN^LF^TH^WAM^ANN^VWN^PI^LY^AL^NPL^FI^EL^MAK^TY^RL^RRL^ICC^FCG^ER^ST^TI
D. immitis NPR-1 IIL^VSM^VV^LF^AIS^WPH^NI^VS^LLM^EF^DES⁻----L^FERS^DG^VNSI^YL^IN^LF^TH^WV^HA⁻-----
O. volvulus NPR-1 -----IAM^ANN^VWN^PI^LY^AL^NPL^FI^EL^MAK^TY^RL^R-----
O. ochengi NPR-1 IIL^VSM^VV^LF^AIS^WPH^NI^VS^LLM^EF^DET⁻----I^FER^HD^GV^NNI^YL^IN^LF^TH⁻IAM^ANN^VWN^PI^LY^AL^NPL^FI^EL^MAK^TY^RL^R-----
L. loa NPR-1 IIL^VSM^VV^LF^AV^SW^LPH^NI^VS^LLM^EF^DES⁻----L^FERY^DG^VNSI^YL^IN^LF^TH^WAM^ANN^VWN^PI^LY^AL^NPL^FI^EL^MAE^TY^RL^RAIL^CCC^FY^REP^ST^IR
A. suum NPR-1 MIL^VSM^VVF^IF^ALT^WPH^NI^VS^LI^IE^YDES^NR^FFR^TFG^ID^NMS^LS^YL^IN^LF^TH^SV^AMT^NI^AN^PV^LY^AW^LN^PFR^HL^VI^QCC^RRY^QPI^QR^N-NV^KCD^AN^T
A. caninum NPR-1 IIL^VSM^VV^IF^GIT^SLPH^NI^VS^TLM^EF^TDS⁻---Q^DLL^AY^NG^ND^YI^YL^LN^LI^ITH^FL^AML^SC^VAN^PL^LY^AF^LN^PE^FREL^IL^NG^LAG^IW^APR^FV^SR^TW^QP^TQ^T
H. contortus NPR-1 IIL^VSM^VV^IF^GIT^SLPH^NI^VS^TLM^EF^TDS⁻---D^LL^AY^NG^ND^YI^YL^LN^LI^ITH^FL^AML^SC^VAN^PL^LY^AF^LN^PE^FREL^IL^NG^LAG^IW^APR^FV^SR^T-----
C. elegans NPR-1 SIL^VT^MV^VW^FG^IT^WPH^NI^VS^LI^IE^YDD^TQ^SFR^LY^GR^DY^DYS^LL^NL^FTH^SL^AMS^NN^VL^NP^VL^YA^WL^NP^SFR^QL^VI^KI^FY^GD^RK^SDR^II^NQ^TS^VY^KT
N. brasiliensis NPR-1 IIL^VSM^VV^IF^GIT^SLPH^NI^VS^TLM^EF^TDS⁻---D^LL^AY^NG^ND^YI^YL^LN^LI^ITH^FL^AML^SC^VAN^PL^LY^AF^LN^PE^FREL^IL^NG^LAG^IW^APR^FV^SR^T-----
S. ratti NPR-1.1 IIL^VSM^VV^IF^GLT^WPH^NI^VS^LV^LE^YDD^TQ^TIF^KID^GDD^LDL^SY^LV^NL^FTH^SL^AMT^NI^VFN^PV^LY^AW^LN^PFR^LDL^CI^QI^FY^KN^RK^AK^ST^NK^NL^SK^CI^TS
S. ratti NPR-1.2 IIL^VSM^VV^IF^AS^LPL^NI^VS^ITEL^SSG⁻---L^FIL^NG^TDI^TY^TT^NI^CA^HG^IA^MI^CT^NP^LY^AL^NP^EFR^IL^VM^KSI⁻-----

Consensus IIL^VSM^VV^IF^AIT^WLPH^NI^VS^LLM^EF^DES DG TYL^IN^LF^TH IAM^N V NP^ILY^A LNP^FREL^MI TL R

<i>B. malayi</i> NPR-1	-----
<i>W. bancrofti</i> NPR-1	REETFEEV-----
<i>D. immitis</i> NPR-1	-----
<i>O. volvulus</i> NPR-1	-----
<i>O. ochengi</i> NPR-1	-----
<i>L. loa</i> NPR-1	EEPLEVE-----
<i>A. suum</i> NPR-1	SKISNNAAINCIGEISHDSPQEIGRIPQLKTATHEDKIHSHYRQKYDDEDVSCADESNEAKHPNVLHRYRVPTSHQNDGNTENPNENATALFTNNMMLIS
<i>A. caninum</i> NPR-1	TCCATKAPHSVLVAI-----
<i>H. contortus</i> NPR-1	-----
<i>C. elegans</i> NPR-1	KIVHDTKHLNGRAKIGGGGSHEALKERELNSCSENLSYHVNGHTRPTPEVQLNEVSSPEISKLVAEPEELIEFSVNDTLV-----
<i>N. brasiliensis</i> NPR-1	-----
<i>S. ratti</i> NPR-1.1	ETKLNHNDSFIPLRDEGKKIITSYQTSKTMEQQQ-----
<i>S. ratti</i> NPR-1.2	-----

Consensus

2. NPR-2 homologues

A. suum NPR-2 -----D I V Y I E F Q D P S M K L E V I A S F A L I Y S V I F V L G V I G N T F V I F L T L R H K K L
A. caninum NPR-2 -----
N. brasiliensis NPR-2.1 -----C H R Y V D D H P D L T N E P I I M L V F A I L Y V H I F V L G I V G N V A V L Y L T L K N R H L
N. brasiliensis NPR-2.2 -----E C A V F T D Q V K D P S L E T P V V V F S I L Y A T E F F L G I I G N I G V I Y L T F G N K K L
H. contortus NPR-2.1 -----C H R Y V D D H P D L T N E L A V M I I F A V L Y V H I F V L G I V G N V A V L Y L T L K N R H L
H. contortus NPR-2.2 -----
C. elegans NPR-2 M S M V N T R V E A P D L L A L K N M L R Q S D G T R M L Q E M R R K L I Q L H S S Q M I N E T E E T C D R Y I D K H P D M T N E P T V L V T F S L L Y L H I F L L G I L G N S A V L Y L T M K H R Q L
S. ratti NPR-2 -----L S Q V N N T K G L Q I M N N I H E Y P Q T C E Y Y Q S L N Y A D S R Y N C T V F H I K C P D L T N E I P V M I S F L L Y Y T I I F V F G I I G N F I I A W L T L K N K S L
B. xylophilus NPR-2 -----M T L F A I V Y T H I F V L G I I G N L S I M F L T L R Y H H L
G. pallida NPR-2 -----M E M L F T S G D A P S S S S T A A T I Q T A R L H S A V V Q L E Q P H E Q Q Q Q Q C L H Y V D Q Q P D P S N S A W A I T L F L A L Y S N I F V L G L L G N L A I V L V T I R C O H L
M. hapla NPR-2 -----Y I I Q S P D P T N S L L A I I I F G I I Y I N I F I F G L L G N L A I V L L T L R C R H L
M. incognita NPR-2 -----Y I I Q S P D P T N S L L A I I I F G I I Y I N I F I F G L L G N L A I V L L T L R C S H L

Consensus C Y I D P D T N V I I F A I L Y I F V L G I I G N L A I L Y L T L R R H L

A. suum NPR-2 Q T V Q N F I L N L A G A D L V V C I F S L P I T P I T N Y K N W Y F G S T M C H G L P W M Q G - I A V F I G T F S L C A I S I D R Y L M V T L P T K K I I D K T R S I W T A I L W T L S I I F T
A. caninum NPR-2 -----S R G S T T S A S I E I P R S F R G S V A V D N I R S S ---L
N. brasiliensis NPR-2.1 Q S V Q N I F I L N L A A S D V L M C I T S L P I T P I T N Y K T W F F A S P V C K L I P L V Q G - A S V F V S T F S L S A I A L D R Y N L V V R P H R H P L R S R G A S V A L L L W I I S A L V C
N. brasiliensis NPR-2.2 Q T V Q N F I L N L A A D L I V C I F S L P I T P I T N I Y K N W Y F G D K M C H S L P W I Q G - A S V F V A T F S L A L A I A I N R Y Q M V V S P H K R M T P T Q A R F V M I G L W I S S V L I T
H. contortus NPR-2.1 Q S V Q N I F I L N L A A S D V L M C I T S L P I T P I T N Y K T W F F A S P V C K L I P L V Q G - A S V F V S T F S L S A I A L D R Y N L V V R P H R H P L R S R G A S V A L L L W I I S A L V C
H. contortus NPR-2.2 ---Q N M F I L N L A A D L I V C I F S L P I T P V T S I Y K N W Y F G E L M C H S L P W I Q G - A S V F V A T F S L A A I A I D R Y M M V V T P H Q R R M T --H A R L V M V C L W V I S G L I T
C. elegans NPR-2 Q T V Q N I F I L N L C A S N V L M C I T S L P I T F I T N Y K W F F S P V C K L I P L V Q G - A S I F V S T F S L S A I A I D R Y N L V V R P H K Q K L S R S A M M I A L L I W V I S V V V C
S. ratti NPR-2 Q T V Q N I F I L N L V I S D I V I C I F S V P V T P I T L I F K N W Y F G S L M C H L M P L A Q V N I L F F V S T L S L S A I A I D R Y I L V V K P H T P I T I K G A R N T A I A L W L F S I L I S
B. xylophilus NPR-2 R T V Q N I F I L N L A I S D V I V C L L S L P F T P V T S I Y K V M F G Q P I C H L L P L V Q A - V S I F V S T F S L S A I A I D R Y N L V V R P H A R P L T I H G A R N V A V L W L S V V V S
G. pallida NPR-2 R S V Q N I F I L N L A I S D I V C L L S L P F T P V S Y I Y K E W L F G S A I C H L L P M V Q A - A S V F V S T F S L S A I A I D R Y W L V I Y P H S G S I S P A K A T V V A A V L W L L S V L I S
M. hapla NPR-2 R S V Q N I F I L N L A I S D V I V C L L S L P F T L V T N I F K E W L F G S A I C H L L P M V Q A - V S V L V S T F S L S A I A I D R Y W L V K ---
M. incognita NPR-2 R S V Q N I F I L N L A I S D V I V C L L S L P F T L V T N I F K E W L F G S A I C H L L P M V Q A - V S V L V S T F S L S A I A I D R Y W L V H R P H G H S L S P S Q A T T V A C I L W A F S L F I S

Consensus Q S V Q N I F I L N L A I S D V I V C L S L P I T P I T N I Y K W Y F G S I C H L L P L V Q G A S V F V S T F S L S A I A I D R Y L V V R P H L S A V V A L L L W I I S V L I S

A. suum NPR-2 L P Y A M Y M D I V V D G I C G Q F C T E K W P D S G L R R T Y T I F V F I V Q F I L P L I I M F I C Y Y K I F D E L K K R - T T K K I K Q I R E R S V V L A S A L A C T P N Q V A S H A L A E K D T
A. caninum NPR-2 Y A Y G W Y M D V E Q L P G I C G E F C T E R W P S S E V R K G Y A L M V L V M Q F I L P F A T M A V C Y A I F A R L R E R - T E S K L K K L T E R T Q L L E S --T A G S S P S G K N E A G T H P
N. brasiliensis NPR-2.1 M P Y G W Y M D V R I G G L C G E F C T E Q W P L P E V R K G Y A L M V L V M Q F I L P F A T M A V C Y Y T I F A R L R E R - T E S K L K K L T E R S Q L L E S --A A G N Q S P S A K A E N G A H P
N. brasiliensis NPR-2.2 L P Y S W Y M A V E H D G L C G K F C T E I W F S P Q L R Q A Y T F V M I A Q F F V P F W I M F Y C Y S R I F K H L K R R - T Q A K I R K M N E R S L I L T A S M P V L S T V K R K M G T K V D V L
H. contortus NPR-2.1 M P Y G W Y M D V R I G G L C G E - C T E K W P L P E V R K G Y A L M V L V M Q F I L P F A T M A V C Y Y T I F A R L R E R R T E S K L K K L S E R S Q L L E S --A V G N S S P S A K T E N G A H T
H. contortus NPR-2.2 L P Y S W F M T L E E H E G L C G K F C T E A W P N A R L R Q A Y T F V L I T Q F L P F W I M F Y C Y S K I F K H L R R R - T Q A R I R K M N E R S L I L T A S M P V L T T V K R K M D A N V D I L
C. elegans NPR-2 M P Y G W Y M D V E K L N G L C G E Y C S E H W L A E V R K G Y T F L V L I T Q F L P F A T M A F C Y N I F S R L R Q R - V E T K L K K L S E R S Q L L E N S T T C G T T N H I V S I N A E A V Q
S. ratti NPR-2 S P Y G V M D I E K Y P F C G D Y C D E Q W S D G - V K P I F S L A V F T A Q F L I P C L T M A F C Y I C I F A K L R A R - T N V K L K K I T E R -----S L L D Q
B. xylophilus NPR-2 L P Y A Y M R L E T Y E E L C G Q F C T E I W F S K S M Q R S Y A L V V L I M Q F L L P F V T M S F C Y S T I F S K L R E R - A N S K L K K L D E R S Q L L N I ---H-----Q A L D K K D S V K L

3. NPR-3 homologues

A. suum NPR-3 -----IQQSLPKKVDLLIQQLIFSVLYFLVWTVAVSGNSLVLYIVTVK
A. caninum NPR-3 -----
N. brasiliensis NPR-3 -----ISGMSNCTNIRDSMFTTIDLTARLVFGMLYTLVWVAIVGNLTVLYVVSFN
H. contortus NPR-3 -----EMSTNCTR IQDTMFETIDLTAVRLVFCVLYCLVWVAIVGNLTVLYVVSFN
C. elegans NPR-3 -----MEGGRNCVMTVQQWQPEYNDMNQIRAFSLLYLLVWVGAIVGNLTVLYVLTFN
B. xylophilus NPR-3 -----MSNVVDYDGVSPVWENFLWRHHQQNCTPIQESIPEKVDSLPIQLLFSVLYITVWLCAITGNLCVTYVVTLK
G. pallida NPR-3 MDYYSPPDNNQQNNNGLSTALAPDQWPQNVVEPNVWPHFLWRSHPPGDRHNICLP IQASFPELVDLLPIQLLFSVLYLLIWLASIVGNASVLYVVS LK
M. hapla NPR-3 -----MVDLLPVQLLFSFLYLLIWLAAAILGNVSVLYVVS LK
M. incognita NPR-3 -----PEMVDLLPVQLLFSFLYLLIWLAAAILGNVSVLYVVS LK

 Consensus IQ S PE VDLL IQLIFSVLYLLVWLAIVGN VLYVVS LK

A. suum NPR-3 QVSLV-VRTIIFGSLAVSDILMSLTSLPVAVTIFTRDWVFPFICKLIGVFQGGSI FVSSFTLTIAVDRMLLI LYPSEAITTERALSIVLG IWAIGY
A. caninum NPR-3 -----A IWL V L G Y
N. brasiliensis NPR-3 QVS-----D L L M S L T S L P W T A V T I F T R E W I F P A P I C K L I G V F Q
H. contortus NPR-3 QVSLV-VRSVFI GCLAVSDMLMSLTSLPVAVSIFTRDWVFPFICKLIGVFQGGSI FVSSFTLTIAVDRMLLI LKPNKEIIGNRAVAIVVA IWLVTGY
C. elegans NPR-3 QVSLV-VRTIVYGC LAGSDLLMCLFSLPITAVSIFTRDWVFPFICKLIGVFQGGTI FVSSFTLTIAVDRMLLI LRPNQEIIVNFPRAVFI VFCIWL L G Y
B. xylophilus NPR-3 QVSLAVRSVFI CSLAVSDI VMSLTSLPITAVSIFTRDWVFPGICCKLMGLFQGGSV FVSSFTLTIAVDRYILLI KHPASSKVNFNKALYSVIL I W I M G Y
G. pallida NPR-3 QVQLSSVRSVFI CSLAASDILMSLTSLPITAVSIFTRDWVFPFICKLMGIFQGGI V FVSSFTLTIAVDRYILLI RHPKQKIKFRTAVSIVVGVWALGY
M. hapla NPR-3 QVQLSSVRSVFI CSLAASDILMSLTSLPITAVSIFTRDWVFPFICKLMGIFQGGAV FVSSFTLTIAVDRYILLI KHPKQKIKFRTALSIVAS I W L V L G Y
M. incognita NPR-3 QVLLS-VRSVFI CSLAASDILMSLTSLPITAVSIFTRDWVFPFICKLMGIFQGGAV FVSSFTLTIAVDRYILLI KHPKQVIKFRTALSIVAS I W L V L G Y

 Consensus QVSLV VRSVFI SLA SDILMSLTSLPITAVSIFTRDWVFP FCKLIGVFQGGSV FVSSFTLT IAVDR I L I H P K I F ALSIV IWL V L G Y

A. suum NPR-3 SLSLPNGIFSRIVHYFPYCGTFCEEAWPDSNLEDG----SKLGRHYGTAVMTLQFGVPALISSFCYWRISRVITQQIE-KRREQQIMLKESEKLT SRRT
A. caninum NPR-3 SLALPTGIFSKAVSFEKICGVFCEEIWPDTSESGLS---SPSRRLYGLSVLLSQFGIPALISSVCYWLSRVMSQLE-RRRGH-TLLKESSEKLVNRKT
N. brasiliensis NPR-3 -----
H. contortus NPR-3 ALALPVGIFSRASVYGETICGVFCEEI W--FRPDAMETGHSAGRRLYGLSVLLSQFGVPALISSVCYWLSRVMSQLE--RRRGHTLLKESSEKLVNRKA
C. elegans NPR-3 SLALPVGIVSDIAVYDEICGTFCEENWPDFNPD TGR---SGIRRAYGLSVLVLQFGIPALISSICYWMSRVMSDQLA-RRRGH-NIRPESSEKLVNRKT
B. xylophilus NPR-3 LFPALPVGIFSTTESYYPFCGTFCEEI WFNFRPDTNNRGDSQMRKTYGLAVLIIQFGLPLVISSLCYWSIGRIISROIK-KRHQOQILLQDNQHRL ENRKH
G. pallida NPR-3 ACALPIGIFSSIQVYPPFCGTFCEENWPD TDEQSGR---SRIRKLYGLLVLIQFGLPTVISSLCYWSIGLNFE LARE---RQVLLQESKDRMKSQKN
M. hapla NPR-3 TCTLPVGIFSSIVEYSPFCGTFCEENWPD TDTQSGR---SRLRKFYGLLVLIQFGLPLVLISTLCYWKIGQLIRLQMRRSERQMVILQESKDRMKSQKS
M. incognita NPR-3 ACAMPVGIFSSIVEYSPFCGTFCEENWPD TDTQSGR---SRLRKFYGLLVLIQFGLPLVLISTLCYWQIGKLR--R---RSERQMVILQESKDRMKSQKS

 Consensus A ALPVGIFS TV Y PFCG FCEE WPD T SG S L R K Y G L S V L V I Q F G L P L I S S L C Y W I R V I S Q L R R Q V L L E S D K L R K T

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A. suum NPR-3      RSNRMMVCMVLCGLVLAWLPLNLIINLSRDFN---GVTAWFSTLFAFCHVIAMTSAAWNPIIYSWFNPQLRMAIKSI-----
A. caninum NPR-3   RANRMMIAMVLGFLFAWMPKNAINLYRDLG---SSVNSNKVINGICAV-----
N. brasiliensis NPR-3 ---RMMIAMVLCGLILAWMPLINAINLYRD-----AMTSAALNPVIYSWFNPQFR-----
H. contortus NPR-3 RANRMMITMVLGFLFAWMPNAINLYRDFGSE--SNTWTFSTVFALCHVSAMTSAALNPVIYSWFNPQFRGAIQSL-----
C. elegans NPR-3   RANRMMIVMVVGFVLAWMPFNAINLYRDLF---GISKMYSTVFALCHVCAMCSAVLNPIIYSWFNPQFRQSIITLFGKTDEARLIKKKPKQSTSKMVSYP
B. xylophilus NPR-3 RSNRMMIAMVGGGLVLAWLPMNLIINLMRDFDASPDFSDWYSLVFAGCHVAMTSAVWNPIIYSWFNLPQFKQTLQACNQHTKQSGYNVVTRAKSVATEGP
G. pallida NPR-3   RTNRMMVTMVLGLVLAWLPMNLIINLWRDFNSE--NSTEWYSLIFAACHSVAMTSAVWNPIIYSWFNPQFKETIRTSLERRRQSQVPKFFGIFVLLLKAL
M. hapla NPR-3     KTNLMMATMVAGLVLAWLPMNLIINLWRDLN---NNTAWFSLIFAASHSTAMTSAVWNPIIYSWFNPQFRETIRKVLERNNNHLTTSSPNFNSNGYCSV
M. incognita NPR-3 KTNLMMATMVAGLVLAWLPMNLIINLWRDLN---NENSWFSLIFAASHSTAMTSAVWNPIIYSWFNPQFRETI-----

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Consensus          RTNRMMI_MVLGLVLAWLPMNLIINLYRD..      T_WFSLIFA_CHVIAMTSAVWNPIIYSWFNPQFR_TI

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A. suum NPR-3      -----
A. caninum NPR-3   -----
N. brasiliensis NPR-3 -----
H. contortus NPR-3 -----
C. elegans NPR-3   TNFSEIRKETEIASTKTKITIAENDYRAGDQLL-----
B. xylophilus NPR-3 EF-----
G. pallida NPR-3   KKRIIFNNENAKFRLPPLC-----
M. hapla NPR-3     NNNDYIRRSSARSLLSALGTAIGVKDDKREGLKTMRNSVVFLLPPKRLKNK
M. incognita NPR-3 -----

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Consensus

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4. NPR-4 homologues

<i>B. malayi</i> NPR-4	-----MYNNNN	CLDMNAELWRNRD	WSTQ	SFT	I	F	V	V	F	F	F	A	I	L	I	G	I	G	V	G	N	L	C	V	I	L	A	I	S	R	T	R	L	Q	T	V	P	N	M	F	I	F	S	L	S	C	S	D	L	V																				
<i>W. bancrofti</i> NPR-4	-----MYNNNN	CLDMNAELWRNRD	WSTQ	SFT	I	F	V	V	F	F	F	A	I	L	I	G	I	G	V	G	N	L	C	V	I	L	A	I	S	R	T	R	L	Q	T	V	P	N	M	F	I	F	S	L	S	C	S	D	L	V																				
<i>D. immitis</i> NPR-4	-----DNN	CLDMNAELWRN	KHDW	STHS	T	I	F	V	V	F	F	T	A	I	L	I	G	I	G	V	G	N	L	C	V	I	L	A	I	S	R	T	R	L	Q	T	V	P	N	M	F	I	F	S	L	S	C	S	D	L	V																			
<i>O. volvulus</i> NPR-4	-----NNN	CLDMNAELWRN	S	R	D	W	S	T	Q	S	S	T	V	F	V	F	F	F	G	A	I	L	I	G	I	G	V	G	N	L	C	V	I	L	A	I	S	R	T	R	L	Q	T	V	P	N	M	F	I	F	S	L	S	C	S	D	V													
<i>O. ochengi</i> NPR-4	-----NNN	CLDMNAELWRN	S	R	D	W	S	T	Q	S	S	T	V	F	V	F	F	F	G	A	I	L	I	G	I	G	V	G	N	L	C	V	I	L	A	I	S	R	T	R	L	Q	T	V	P	N	M	F	I	F	S	L	S	C	S	D	V													
<i>L. loa</i> NPR-4	-----MYNNN	CLDMNAELWRNRD	WSTQ	SST	I	F	V	V	F	F	F	A	I	L	I	G	I	G	I	G	N	L	C	V	I	L	A	I	S	R	T	R	L	Q	T	V	P	N	M	F	I	F	S	L	S	C	S	D	L	V																				
<i>A. suum</i> NPR-4	-NALWCN	KSRCAVLF	LILPKK	SLRMS	NE	C	L	D	M	N	E	L	W	R	F	R	N	D	L	T	Q	P	A	V	M	A	F	A	L	L	Y	A	T	I	V	L	G	I	F	G	N	L	C	V	I	L	A	I	A	R	T	R	S	L	Q	T	V	P	N	L	F	I	F	S	L	S	C	S	D	V
<i>N. brasiliensis</i> NPR-4	-----MRNST	CLN	N	D	E	L	W	E	Y	R	N	D	Y	T	T	R	A	F	T	M	V	E	A	F	F	S	V	I	L	C	G	F	V	G	N	L	C	V	I	L	A	I	T	R	N	V	L	Q	T	V	P	N	L	F	I	L	S	L	S	C	S	D	I							
<i>H. contortus</i> NPR-4	-----TTPV	L	S	R	T	S	K	F	S	K	R	S	E	F	C	F	V	S	T	M	V	F	A	I	L	S	V	I	L	C	G	F	I	G	N	L	C	V	I	A	I	T	R	N	V	L	Q	T	V	P	N	L	F	I	L	S	L	S	F	S	D									
<i>C. elegans</i> NPR-4	-----MNGSD	CLN	N	S	E	L	W	L	Y	R	E	D	L	S	R	W	Y	I	M	L	E	F	A	F	L	L	I	I	A	A	G	I	I	G	N	L	C	V	I	L	A	I	T	R	N	S	L	Q	T	V	P	N	L	F	I	L	S	L	S	C	S	D								
<i>S. ratti</i> NPR-4	-----N	C	T	T	L	N	E	Y	R	Q	T	S	N	D	W	S	T	Y	S	V	W	F	F	A	V	I	S	I	I	L	S	G	I	V	G	N	L	C	V	I	L	A	I	R	T	K	S	L	Q	T	V	P	N	Y	F	I	M	S	L	S	C	S	D							
<i>B. xylophilus</i> NPR-4	-----CSS	V	N	E	Q	L	W	V	L	R	R	D	P	T	Q	L	W	V	W	A	E	F	A	F	F	S	L	I	I	C	G	C	L	G	N	L	C	V	I	L	A	I	S	R	T	K	S	L	Q	T	V	P	N	M	F	I	F	S	L	S	C									
<i>G. pallida</i> NPR-4	-----MAFP	N	D	M	N	H	F	L	W	E	F	Q	R	D	P	T	S	R	P	L	T	A	V	F	A	V	V	S	L	I	V	L	G	V	S	G	N	L	C	V	I	L	S	I	G	R	T	R	S	L	Q	T	V	S	N	L	F	I	F	S	L	S								
<i>M. hapla</i> NPR-4.1	-----MELH	S	P	T	L	L	F	N	A	S	T	P	S	V	C	E	D	M	N	A	L	W	N	A	R	R	D	L	T	R	P	F	V	M	L	A	F	A	S	F	Y	S	I	I	L	G	I	G	N	S	C	V	I	L	A	I	R	S	L	Q	T	V	P	N	M					
<i>M. hapla</i> NPR-4.2	MQ	E	I	H	L	I	Y	N	N	Q	N	N	N	N	Y	S	E	F	I	S	L	P	C	V	D	M	N	K	I	L	A	L	R	D	P	T	A	R	L	P	I	A	A	F	A	S	L	Y	T	I	K	N	F	L	F	K	G													
<i>M. incognita</i> NPR-4	---ME	A	S	T	M	E	L	L	P	P	T	I	L	F	N	V	S	A	P	S	V	I	C	E	D	M	N	A	L	W	N	T	R	R	D	L	T	C	P	F	V	M	A	F	A	S	L	Y	S	I	L	G	I	G	N															

Consensus TCLDMNAELW RRDWSTQ TM IFAFFYSVILIGIVGNLCVILAI SRTRSLQTVPNMFI FLSLCS DIV

<i>B. malayi</i> NPR-4	C	F	T	S	A	T	I	P	I	A	A	F	K	K	E	W	I	F	G	A	V	L	C	S	I	A	P	F	I	A	G	A	S	L	C	F	S	T	F	T	L	S	A	I	S	V	D	R	F	L	L	I	F	P	T	R	K	A	L	S	R	L	Q	A	L	I	V	I	M	V	I	C	I	L	S	T	S	L	S	A	P	V	I	F	K	Q	R	L	K	R	F	G	N	Y	C	G
<i>W. bancrofti</i> NPR-4	C	F	T	S	A	T	I	P	I	A	A	F	K	K	E	W	I	F	G	P	V	L	C	S	I	A	P	F	I	A	G	A	S	L	C	F	S	T	F	T	L	S	A	I	S	V	D	R	F	L	L	I	F	P	T	R	K	A	L	S	R	L	Q	A	L	I	V	I	M	V	I	C	I	L	S	T	S	L	S	A	P	V	I	F	K	Q	R	L	K	R	F	G				
<i>D. immitis</i> NPR-4	C	F	T	S	A	T	I	P	I	T	A	F	K	K	E	W	I	F	G	A	V	L	C	S	I	A	P	F	I	A	G	A	S	L	C	F	S	T	F	T	L	S	A	I	S	V	D	R	F	L	L	I	F	P	T	R	K	A	L	S	R	L	Q	A	L	I	V	I	M	V	I	C	I	L	S	T	S	L	S	A	P	V	I	F	K	Q	R	L	K	R	F					
<i>O. volvulus</i> NPR-4	C	F	T	S	A	T	I	P	I	T	A	F	K	K	E	W	I	F	G	A	V	L	C	S	I	A	P	F	I	A	G	A	S	L	C	F	S	T	F	T	L	S	A	I	S	V	D	R	F	L	L	I	F	P	T	R	K	A	L	S	R	L	Q	A	L	I	V	I	M	V	I	C	I	L	S	T	S	L	S	A	P	V	I	F	K	Q	K	L	K	T	Y	A	N	Y		
<i>O. ochengi</i> NPR-4	C	F	T	S	A	T	I	P	I	T	A	F	K	K	E	W	I	F	G	A	V	L	C	S	I	A	P	F	I	A	G	A	S	L	C	F	S	T	F	T	L	S	A	I	S	V	D	R	F	L	L	I	F	P	T	R	K	A	L	S	R	L	Q	A	L	I	V	I	M	V	I	C	I	L	S	T	S	L	S	A	P	V	I	F	K	Q	K	L	K	T	Y	A	N			
<i>L. loa</i> NPR-4	C	F	T	S	A	T	I	P	I	A	A	F	K	K	E	W	I	F	G	A	V	L	C	S	I	A	P	F	I	A	G	A	S	L	C	F	S	T	F	T	L	S	A	I	S	V	D	R	F	L	L	I	F	P	T	R	K	A	L	S	R	L	Q	A	L	I	V	I	M	V	I	C	I	L	S	T	S	L	S	A	P	V	I	F	K	Q	R	L	K	R	F					
<i>A. suum</i> NPR-4	C	C	I	S	A	T	I	P	I	T	A	F	K	K	E	W	I	F	G	A	L	C	R	F	A	P	F	I	A	G	A	S	L	C	F	S	T	F	T	L	A	I	S	I	D	R	Y	L	L	I	R	F	P	M	K	P	L	S	H	L	H	A	I	L	V	I	G	L	T	C	V	L	A	C	T	S	S	P	I	I	V	R	Q	K	I	G										
<i>N. brasiliensis</i> NPR-4	C	S	I	S	A	T	I	P	I	T	A	F	K	K	E	W	I	F	G	E	L	C	R	V	A	P	F	I	A	G	A	S	L	C	F	S	T	F	T	L	A	I	S	I	D	R	Y	L	L	I	R	F	P	M	K	P	L	T	H	F	A	V	L	V	I	G	L	T	C	V	L	A	C	T	S	S	P	I	I	F	R	Q	K	I	G											
<i>H. contortus</i> NPR-4	C	S	I	S	A	T	I	P	I	T	A	F	K	K	E	W	I	F	G	E	L	C	R	V	A	P	F	I	A	G	A	S	L	C	F	S	T	F	T	L	A	I	S	I	D	R	Y	L	L	I	R	F	P	M	K	P	L	T	H	F	A	V	L	V	I	G	L	T	C	V	L	A	C	T	S	S	P	I	I	F	R	Q	K	I	G											
<i>C. elegans</i> NPR-4	C	C	T	S	A	T	I	P	I	T	A	F	K	K	E	W	I	F	G	E	A	L	C	R	I	A	P	F	I	A	G	A	S	L	C	F	S	T	F	T	L	A	I	S	I	D	R	Y	L	L	I	R	F	P	M	R	K	P	I	T	H	Y	O	A	V	G	V	I	A	I	C	A	F	A	A	T	T	S	P	I	M	F	K	Q	K	I	G									
<i>S. ratti</i> NPR-4	S	T	I	S	A	T	I	P	P	F	T	A	F	A	K	N	W	F	G	R	H	G	M	I	F	N	T	L	G	-	M	S	I	F	S	I	L	L	A	I	S	I	D	R	L	L	I	R	F	P	M	K	T</																																											

B. malayi NPR-4 CTEEWGIDQ-SGRRVYGSIMLSVQFIVPLVIIIFTCYTAISFKLGK-----QRAAIKRRQRTNRMLIGMVVAFSASWFFSVLFN
W. bancrofti NPR-4 CTEEWGIDQ-SGRRVYGSIMLSVQFIVPLVIIIFTCYTAISFKLGK-----QRAAIKRRQRTNRMLIGMVVAFSASWFFSVLFN
D. immitis NPR-4 CTEEWGIDQ-SGRRVYGSIMLSVQFIVPLVIIIFTCYTAISFKLGK-----QRAAVKRRQRTNRMLIGMVVAFSASWFFSVLFN
O. volvulus NPR-4 CTEEWGMDQ-SGRRVYGSIMLSVQFVPLMIITFCYTAISFKLGKGIILQRKLRQ-QNEWQLGMSDQAR-AAIKRRQRTNRMLIGMVVAFSASWFFSVLFN
O. ochengi NPR-4 CTEEWGMDQ-SGRRVYGSIMLSVQFVPLMIITFCYTAISFKLGKGIILQRKLRQ-QNEWQLGMSDQARAAAIKRRQRTNRMLIGMVVAFSASWFFSVLFN
L. loa NPR-4 CTEEWGIDQ-SGRRVYGSIMLSVQFIVPLVIIIFTCYTAISFKLGKGIILQRNRKH-HN-EWOLGMDTQQRAAIKRRQRTNRMLIGMVVAFSASWFFSVLFN
A. suum NPR-4 CTEDWGMQ-SGRRVYGAIMVGVQFVPLTIIIVICYTAIAVKGQGLIKGKN--SNYDQVQVMTDQQRAAVRRRQRTNRMLIGMVVAFSASWLVSVLFN
N. brasiliensis NPR-4 CTEDWSDNE-SQRKVVYGAALLCVQLVPLTIIIVVSYTAISLRIGQSMILRNTKRYATTNWNVQLTDQQRMAKRRQRTNRMLIAMVVAFSASWMMVSVTFN
H. contortus NPR-4 CTEDWSDNE-SQRKVVYGAALLCVQLVPLTIIIVVSYTAISLRIGQSMILRNTKRDSSSNWNVQLTDQQRMAKRRQRTNRMLIAMVVAFSASWMMVSVTFN
C. elegans NPR-4 CTENWGANESQRKIYGAALMFLQLVPLTIIIIISYTAISLRIGQSMILKGAKKQKTDNWEMLSDQORIAVKRRQRTNRMLIGMVVAFCSWIWSVTFN
S. ratti NPR-4 CDENWGDKDSFRMYVSVLIYAVQFVPLTIIIIICYTLISLRINQSLLLKAK--NKNGWET---DQERVAVKRRARTNRMFIGMVVAFILSYLPNVVFVN
B. xylophilus NPR-4 CFEDWGPYS-SQRRAYGTIVLSVQFIIPLSIIIIICYTAISVRLGQSMILKGGK--RDYQWOLQNDQHRAATKRRQRTNRMFIAMVVAFSLSWVSVVFN
G. pallida NPR-4 CFEDWGSNE-LYRETYGTLIIIVQFFVPLIISICYIGISVRLSRNILLI---R--RKKMGNSWVHHRQSMADRRQRTNRMFIAMVIAFSLSWVSVLYN
M. hapla NPR-4.1 CFEDWGEHM-GIRRIYGTLLIIVQFIIPLNFIIICCYTAISFRIGKGVN--LRTK-KKCEWQKIPSAQRNATKRRQRTNRMFIAMVIAFSSWVSVLYN
M. hapla NPR-4.2 CFEHWSPEY-RLREYVGTILLIIVQFVPLIITIFCYTGISVRLNKSVELL-----RKKMGNTWQIYHOMANQRQRTNRMFVLMVVFVILLSWIWTVLFN
M. incognita NPR-4 CFEDWGEIMI-GIRRIYGTLLIIVQFIIPLALITFCYTAISFRIGKGSVN--LRTR-KKCEWQMPISAQRNATKRRQRTNRMFIAMVIAFSSWVSVLYN

Consensus CTEDWG D S RRIYGSILLSVQFVPLVIITFCYTAISFKLGK ILLR K WNV L QQRAAIKRRQRTNRMLIGMVVAFSASWIWSVLFN

B. malayi NPR-4 VLRDYDCLPKWCQNQYFFGIATHCIAMSTVW-NPLLYAALNLQLRAAFRLLEPCVQRQPEMKSATYNCPL---LQSGSALRNDLTK-NKILNCDH
W. bancrofti NPR-4 VLRDYDCLPKWCQNQYFFGIATHCIAMSTVW-NPLLYAALNLQLRAAFRLLEPCVQRQKVKQKSATYNCPL---LQSGSALRNDFTK-NKILNCDY
D. immitis NPR-4 VLRDYDYLPEWCQDQYFFGIATHCIAMSTVW-NPLLYAALNLQLRAAFRLLEPCVQLQARKSTAHCNCKPL---LQSRSVLRNDFTK-NKILNCD-
O. volvulus NPR-4 VLRDYDCLPQCQHQYFFGIATHCIAMSTVW-NPLLYAALNLQLRAAFRLLEPCVQRQQTQESTTVHSR-----KPLRDDFSK-NKILNIDR
O. ochengi NPR-4 VLRDYDCLPQCQHQYFFGIATHCIAMSTVW-NPLLYAALNLQLRAAFRLLEPCVQRQQTQESTTVHSR-----KPLRDDFSK-NKILNYDR
L. loa NPR-4 VLRDYDCLPEWCQDQYFFGIATHCIAMSTVW-NPLLYAALNLQLRAAFRLLEPCVQRREERKSATYNCPL---LQSRNVLRDDFTK-SKILNCDH
A. suum NPR-4 VLRDYDRLPDWPKIQEYLYGIATHCIAMSTVW-NPLLYAVLNPQLRAAFIRLMPESCLQSTTTFERCDQLTRNGTLLLETGDRRSTKMQQNVRQALSSAP
N. brasiliensis NPR-4 VLRDYDYLQVWKDQYELFGIATHCIAMSTVW-NPLLYAMLNLQLRAAFIELEPRVIRAKLRIGNDNASRLLNG--AAQPTLASSPSLYGSS-----
H. contortus NPR-4 VLRDYDYLQVWKDQYELFGIATHCIAMSTVW-NPLLYAMLNLQLRAAFIELEPRVIRLRLRNDHSIRLING---SHHSIAAIPTLKYGSSVRFSSFS
C. elegans NPR-4 VLRDYLYLPELTKTQEYIFGIATHCIAMSTVW-NPLLYAVLNLQLRAAFIDLMPHWLERHNLLEGDNSSPLLN-----HPTMTITN--KYGSTATKIVK
S. ratti NPR-4 VLRDFNQVPKFISEQYFFGIVMHCIAMSTVW-NPLLYAALNYQLRAAFIDLMPACIHRKL-----
B. xylophilus NPR-4 VFKDYELLPSVMEKEYIVGILSILHCIAMSTVW-NPLLYAMNQLRAAFIQLMPVCIKREYLYKEEHPMAQSCCKPRPSTLLTPNGNVQDSSLPSGCTT
G. pallida NPR-4 VLRDYECLPPLVTRQEFFGILTHCIAMSTVW-NPLLYALLNLQLRAAFRLLEPESTKFKMAKRFDRIGSKSKLTAKDAKLMAPTLLMATFEQRKIVK
M. hapla NPR-4.1 VLRDYDGLPNLVRDQEFFGILTHCIAMSTVW-NPILYALLNLQLRAAFQLVPEQCIKHSITCTCSKSNR-----LSGRSVAFCIYLEESQLIGSSV
M. hapla NPR-4.2 VLRDFGLPEFISEQEFFLYGVIITHAIAMSTVW-NPILYALLNLQLRAAFNLNLPVIKRKLWLSKERSLNKLLAPAPSALYISSNKEIINNLPPRASSCL
M. incognita NPR-4 VLRDYDGLPKFVHDQEFFGILTHCIAMSTVW-NPILYALLNLQLRAAFQLVPEQCIKHSITCTCSPNKG-----LSGRSVAFCAYLEESRLIGSSV

Consensus VLRDYD LP WI DQYFFGIATHCIAMSTVW NPLLYALLNLQLRAAFLLP L C I R L R R LL S

B. malayi NPR-4 RSCDLLAVYKAVNRYESFEVDDI-----
W. bancrofti NPR-4 RKR-----
D. immitis NPR-4 -----
O. volvulus NPR-4 RKR-----

<i>O. ochengi</i> NPR-4	R
<i>L. loa</i> NPR-4	R
<i>A. suum</i> NPR-4	GQYGATESSKGSFNVI IHLTTIGRDRYSRKFERCSFRSLVQRLSTKRENTSLVNNAHEFRYSQQYQILSNSTSSGSPITASQLINDCQQIQHSFIKRSI
<i>N. brasiliensis</i> NPR-4	-----
<i>H. contortus</i> NPR-4	YAFPQECSLLYHVNFELHYSNNVNFMWSTSNYSQSLY-----
<i>C. elegans</i> NPR-4	ATYINTSNGQPYVSTSLVGKVQPEAPSFKFNNGSRRKKSAMMRILVQKRNAEEEEQLITKESPPPEIQMDTLCAASIIIPRRKSAQPRSTNEKVVLPKAS
<i>S. ratti</i> NPR-4	-----
<i>B. xylophilus</i> NPR-4	PENGLWLPAGFLKTGPRNSISSMASAFSSQPNGGLDDGTRLVQSTLTSTKYGAVESSENTRWSDEGFVDHGTVRLTTF-----
<i>G. pallida</i> NPR-4	EIPNEPRQLKTDFLPKPRKFESRTNKSLCSSEGR-----
<i>M. hapla</i> NPR-4.1	LFGASSHLQKRETGYGNKNCFNCLIGSSGSIIESSNETQKQMIAVRSAEKKRDDQIPVQKNFFQMC-----
<i>M. hapla</i> NPR-4.2	LPLAHNKNEENYLKSSGDELFSSTTKSGTNLVSGSASVRSQSINLKSTRSVRGTGATISA-----
<i>M. incognita</i> NPR-4	LFGTTGQVQRRETNYENKNCFNCLIGSSRSVESSNETQKQTFSVKCEGNKGDAKILSHNHRHQLERI TADVGFDEQTWTEQLRKDSEDDALDDCNDL
Consensus	R

<i>B. malayi</i> NPR-4	-----
<i>W. bancrofti</i> NPR-4	-----
<i>D. immitis</i> NPR-4	-----
<i>O. vovulus</i> NPR-4	-----
<i>O. ochengi</i> NPR-4	-----
<i>L. loa</i> NPR-4	-----
<i>A. suum</i> NPR-4	SHLHNESANCPFIIRSY
<i>N. brasiliensis</i> NPR-4	-----
<i>H. contortus</i> NPR-4	-----
<i>C. elegans</i> NPR-4	F-----
<i>S. ratti</i> NPR-4	-----
<i>B. xylophilus</i> NPR-4	-----
<i>G. pallida</i> NPR-4	-----
<i>M. hapla</i> NPR-4.1	-----
<i>M. hapla</i> NPR-4.2	-----
<i>M. incognita</i> NPR-4	RERDTERI-----
Consensus	

5. NPR-5 homologues

<i>B. malayi</i> NPR-5	-----M L I G I T N G S V L I A F T K N R R L R S A R N I F L L N L I
<i>W. bancrofti</i> NPR-5	-----M L I G I T N G S V L I A F I K N R R L R S A R N I F L L N L I
<i>D. immitis</i> NPR-5	-----M F I G I I G N G S V L I A F T K N R R L R S A R N I F L L N L I
<i>O. volvulus</i> NPR-5	-----I K V I F W L Y G L L M I I G I T N G S V L I A F T K N R R L R S A R N I F L L N L I
<i>O. ochengi</i> NPR-5	-----I K V I F W L Y G L L M I I G I T N G S V L I A F T K N R R L R S A R N I F L L N L I
<i>L. loa</i> NPR-5	-----M F I G I T N G G V L I A F T K N R R L R S A R N I F L L N L I
<i>A. suum</i> NPR-5	-----V Q V A F S L V Y G A L M I V G L V G N G G V L F A V S K N K R L R S A R N I F L L N L I
<i>A. caninum</i> NPR-5	-----Q L F V K S A F T L Y G F L F I L G L V G N G G V F A M A N N R R L R S A R N I F L L N L I
<i>N. brasiliensis</i> NPR-5	-----T E N A T C I L V V D A I R S E G L D D V T T R L F V K S A F T L Y G L L F V L G L V G N G G V F A M A N N R R L R S A R N I F L L N L I
<i>H. contortus</i> NPR-5	-----Q L F V K S A F T L Y G L L F I L G L V G N G G V F A M A N N R R L R S A R N I F L L N L I
<i>C. elegans</i> NPR-5	---M V S S A A T I S T I S T T T P S T I S N V I T S H S N N G S C I Q I A E A I A A Q G I D D I T V D F Y I R S I F T F Y G F L F V L G I F G N G G V L W A V A R N K R L R S A R N I F L L N L I
<i>S. ratti</i> NPR-5	-----I R F L I T F T Y A L M I I G I F G N G G V T I V L K N K R L R N A R N I F L M N L M
<i>B. xylophilus</i> NPR-5	-----V Q A L F G L V Y L V L F V L G L V G N G G V F L A V L Q N K R L R S A R N I F L L N L I
<i>G. pallida</i> NPR-5.1	-----M D N E T N V Q T A K K E C I E V A E A I R A Q G I N D L A S W P S F Q S G F T I V Y G C L F L L G L L N G S V L L A F A Q N K R L R S A R N I F L L N L I
<i>G. pallida</i> NPR-5.2	-----M N Y S P Q Q K I E Q I P I S T D S K G N G S E Q Q I V V S G R M A S Q W Q P A E D C V H L S E V I T A H G I D D W T N N G S V L M A F G R A N R I R S T R N F F L L N L I
<i>M. hapla</i> NPR-5	M A L I E E K Q Q H N L T P Q T S S Y I S P --- S S N N Q Q P V C T E V S E A I L S Q G I D D L T S W A A V Q C A I A A A Y G C L F L L G L L N G S V L L A F A Q N K R L R S T R N L F L L N L I
<i>M. incognita</i> NPR-5	M T L I E E K H Q N H L T P Q T S A Y H Q N E N I S P N N Q Q Q I V C T E V S E A I L A Q G I D D L T S W T A V Q C A I A A A Y G C L F L L G L L N G S V L L A F A Q N K R L R S T R N L F L L N L I
Consensus	V F <u>Y G L I L G I V G N G S V L I A F</u> K N R R L R S A R N I F L L N L I

<i>B. malayi</i> NPR-5	L T D L L L C V T A I P V T P W Y A L T K N W F G A L M C R L M P L S N S C S V F V T S W S L T A I A I D K F V H I I - G P I R A P V S I S Q A G L V T A F I W V V S T M I N I P Y L M S Y E L V D G
<i>W. bancrofti</i> NPR-5	L T D L L L C V T A I P V T P W Y A L T K N W F G A L M C R L M P L S N S C S V F V T S W S L T A I A I D K F V H I I - G P I R A P V S I S Q A G L V T A F I W V V S T M I N I P Y L M S Y E L V D G
<i>D. immitis</i> NPR-5	L T D L L L C V T A I P V T P W Y A L T K N W F G A L M C R L M P L S N S C S V F V T S W S L T A I A I D K F V H I I - G P I R A P V S I S Q A S L V T T F I W V V S T M I N I P Y L M S Y E L V D G
<i>O. volvulus</i> NPR-5	L T D L L L C V T A I P V T P W Y A L T K N W F G A L M C R L M P L S N S C S V F V T S W S L T A I A I D K F V H I I - G P I R A P V S I S Q A G L V T A F I W V I S T V I N I P Y L L S Y E L V D G
<i>O. ochengi</i> NPR-5	L T D L L L C V T A I P V T P W Y A L T K N W F G A L M C R L M P L S N S C S V F V T S W S L T A I A I D K F V H I I - G P I R A P V S I S Q A G L V T A F I W V I S T V I N I P Y L L S Y E L V D G
<i>L. loa</i> NPR-5	L T D L L L C V T A I P V T P W Y A L T K N W F G A L M C R L M P L S N S C S V F V T S W S L T A I A I D K F V H I I - G P I R A P V S I S Q A S L V T A F I W V V S T M I N I P Y L M S Y E L V D G
<i>A. suum</i> NPR-5	L T D I L L C V T A I P V T P W Y A L T K N W F G A L M C R L M P L S N S C S V F V T S W S L T A I A I D K F V H I I - D P T R A P V R V R Q A L I T L F I W L V C S L I N I P Y L M S Y D L V D G
<i>A. caninum</i> NPR-5	L T D L L L V L T A V P V T P W -----
<i>N. brasiliensis</i> NPR-5	L T D L L L V L T A V P V T P W Y A L T K N W Q F G S A M C H I M P L S N S C T I V F V T S W S L T A I S I D K Y L H I I - D P T K A P V T K R Q A L A I T L L I W L L S T L I N V P Y L L S Y E L V D G
<i>H. contortus</i> NPR-5	L T D L L L V L T A V P V T P W Y A L T K N W Q F G S A M C H I M P L S N S C S V F V T S W S L T A I S I D K Y L H I I - D P T K A P V T V R Q A L I T L L I W L L S T L I N V P Y L L S Y E L V D G
<i>C. elegans</i> NPR-5	F T D L I L V F T A I P V T P W Y A M T K D W A F G S V M C H L V P L S N S C S V F V T S W S L T A I S L D K F L H I N - D P T K Q P V S I R Q A L A I T F L I W I V S T L I N I P Y L M S F E H V D G
<i>S. ratti</i> NPR-5	V T D L I L C C F G I P L T Y I Y A R E K K W T L G L I M C R I T P L G S N C A V F V S - W S I C A I A L D K F I H I V - N P I R Q P V S I K Q A T V I T V L I W I L S I L A N I P P I V N S D L K S G
<i>B. xylophilus</i> NPR-5	L T D I L L C L T G I P V T P W Y A L S K E W V F G S L M C R L M P L S N S C S V F V T S W S L T A I A I D K F M H I I - D P T R E Q F S M K L A G M V T V L I W A V S T C A N I P Y L M S E L V D G
<i>G. pallida</i> NPR-5.1	L T D I L L C L T A V P V T P W Y A L T K D W S F G S L M C R V V P L S N S C A V F V T S W S L T A I A I D K F M H I I - D L T R E Q F S L R T A G F V T F I I W T L S S L L N I P Y L L S Y E L V N G
<i>G. pallida</i> NPR-5.2	L T D V L L C F T A I P I T P C Y A V Q K N W V F G P V L C R F V P F C N S C A V F V T R - - - - A I A F D K H M H I V D P T R R R F R R L I G F V T L A I W L M S L V V N I P Y L L S F E L V Q G
<i>M. hapla</i> NPR-5	L T D I L L C L T A V P V T P W Y A L T K D W A F G P L M C R L V P L S N S C A V F V T S W S L C A I A L D K F L H I I - D P T R G Q F S L R T A A T I T F V I W I L S T L L N I P Y L L S Y K L V N G
<i>M. incognita</i> NPR-5	L T D I L L C L T A V P V T P W Y A L T K D W A F G P L M C R L V P L S N S C A V F V T S W S L C A I A L D K F L H I I - D P T R G Q F S L R T A A T I T F V I W I I S T L L N I P Y L L S Y K L V N G
Consensus	L T D L L L C L T A I P V T P W Y A L T K N W F G A L M C R L M P L S N S C S V F V T S W S L T A I A I D K F V H I I D P T R A P V S I R Q A G L V T I W V V S T L I N I P Y L L S Y E L V D G

B. malayi NPR-5
W. bancrofti NPR-5
D. immitis NPR-5
O. volvulus NPR-5
O. ochengi NPR-5
L. loa NPR-5
A. suum NPR-5
A. caninum NPR-5
N. brasiliensis NPR-5
H. contortus NPR-5
C. elegans NPR-5
S. ratti NPR-5
B. xylophilus NPR-5
G. pallida NPR-5.1
G. pallida NPR-5.2
M. hapla NPR-5
M. incognita NPR-5

AYYVP--NNTAPFCGLFCDEINWNGEMPRLRYGSSVLLQ-FVIPLTIITYCYARILAKVASDMIQNVQFSKLSIAQREAEATNRRKR VNYILIGMVA
AYYVP--NNTAPFCGLFCDEINWNGEMPRLRYGSSVLLQ-FVIPLTIITYCYARILVQVSDMIQNVQFSKLSIAQREAEATNRRKR VNYILIGMVA
AYYVP--NNTIPFCGLFCDEINWNGEIPRLRYGSAVLLQ-FVIPLIITYCYARILAKVSSDMIQNVQFSKLSNAQREAEATNRRKR VNYILIGMVA
AYYVP--NNTKPF CGFCDEINWNGEIPRLRYGSTVLLQ-FVIPLIITYCYARILAKVASDMIQNVQFSKLSSTAQREKATNRRKQ VNYILIGIVIA
AYYVP--NNTKPF CGFCDEINWNGEIPRLRYGSTVLLQ-FVIPLIITYCYARILAKVASDMIQNVQFSKLSSTAQREKATNRRKQ VNYILIGIVIA
AYYVP--NNTAPFCGLFCDEINWNGEIPRLRYGSAVLLQ-FVIPLTIITYCYARILAKVASDMIQNVQFRKLSSTAQREAEATNRRKR VNYILIGMVA
AYYVP--ENATPFCGHFCDELNWQGEIPRLRYGSTVLLQ-FVPLAIITYCYSRILEKVAKDMIQNAQFSELSSTAQREAEATNRRKR VNYILIGMVVA
-----TPYCGKFCDETNWQSENSRRLYGTMVMLLQ-FVIPMAIITYCYFRILRKVSKDMIQNVQFSASLSQKQRVDAISRKKK VNYILIGMVAT
SYVVP--ENSTPFCGKFCDETNWQSENSRRLYGTMVMLLQ-FVIPMAIITYCYFRILRKVSKDMIQNVQFSASLSQKQRIDAI SRKKK VNYILIGMVAT
SYVVP-----PYCGKFCDETNWQSENSRRLYGTMVMLLQFVIPMSIITYCYFRILRKVSKDMIQNVQFSASLSQKQRVDAISRKKK VNYILIGMVAT
SFYVQ--PGETPYCGHFCDEANWQSENSRRLYGTMVMLLQ-FVVPMAVITYCYFRILQKVKSKDMIQNAQFCQSLTQKQRSDATSRKKK VNYILIAMVVT
EATSSFEDNKPLCGVFCDEET-WDESTRQTYGLIALIFQ-FVVPMAIITYCYFRILRKVSKDMIQNVQFSASLSQKQRIDAI SRKKK VNYILIAMVLA
AHFVP--VNSTPFCGHFCDETNWQSENSRRLYGTMVMLLQ-FVIPMSIITYCYFRILRKVSKDMIQNVQFSASLSQKQRIDAI SRKKK VNYILIAMVAT
DYVVP--KNSTPFCGQFCDELNWQSGDTRRLYGTGMVLFQ-FVVPMAIITYCYFRILRKVSKDMIQNVQFSASLSQKQRIDAI SRKKK VNYILIAMVIA
VYMASQDDAI TPFCDTFCDEFNWESESRQFYGAVVLLFQ-FVVPMAIITYCYFRILRKVSKDMIQNVQFSASLSQKQRIDAI SRKKK VNYILIAMVIA
DYVVP--RNSTPFCGQFCDELNWQSGDTRRLYGTGMVLFQ-FVVPMAIITYCYFRILRKVSKDMIQNVQFSASLSQKQRIDAI SRKKK VNYILIAMVIA
DYVVP--RNSTPFCGQFCDELNWQSGDTRRLYGTGMVLFQ-FVVPMAIITYCYFRILRKVSKDMIQNVQFSASLSQKQRIDAI SRKKK VNYILIAMVIA

Consensus AYYVP NNTPF CG FCDEINWNGEIPRLYGT VMLLQ FVIPLAIITYCY RIL KVAKDMIQNVQFS SLSNAQR DAINRKR VNYILIGMVA

B. malayi NPR-5
W. bancrofti NPR-5
D. immitis NPR-5
O. volvulus NPR-5
O. ochengi NPR-5
L. loa NPR-5
A. suum NPR-5
A. caninum NPR-5
N. brasiliensis NPR-5
H. contortus NPR-5
C. elegans NPR-5
S. ratti NPR-5
B. xylophilus NPR-5
G. pallida NPR-5.1
G. pallida NPR-5.2
M. hapla NPR-5
M. incognita NPR-5

FIGCWLPLTVVNLKDFKLEPLFLEQPFWPLLAHVIA MSTVIWNP LFFWLTKRKK-AHTQMPRFVSVF-NAFGTTISRISSMHRKSNAFRSTAWII
FIGCWLPLTVVNLKDFKLEPLFLEQPFWPLLAHVIA MSTVIWNP LFFWLTKRKK-AQIQMPRFVSVF-NAFGTTISRISSMHRKSNAFRSTAYII
FIGCWLPLTVVNLKDFS-----K-----AHVIA MSTVIWNP LFFWLTKRKK--KKSQMPRFVSVF-NAFGTTISRISSMHRKSNAFRSTAYII
FIGCWFPLTVVNLKDFSKPEKFLKQPFWPLV-AHVIA MSTVIWNP LFFWLTKRKK--TKSQMPRFVSVF-NAFGTTISRISSMHRKSNAFRSTAYII
FIGCWFPLTVVNLKDFSKPEKFLKQPFWPLV-AHVIA MSTVIWNP LFFWLTKRKK--TKSQMPRFVSVF-NAFGTTISRISSMHRKSNAFRSTAYII
FIGCWLPLTVVNLKDFKLEPLFLEQPFWPLV-AHVIA MSTVIWNP LFFWLTKRKK-AHTQMPRFVSVL-NVFGTTISRISSMHRKSNAFRSTAYII
FIGCWLPLTAVNLKDFSKPEKFLKQPFWPLV-AHVIA MSTVIWNP LFFWLTKRQ--KRPIIGRIIAS-DALTSFVSRINSIRRTS-----
FIGCWLPLTAVNLKDYKIEPFLRAQPFWPLV-AHVIA MSTVIWNP LFFWLTKRQ--KRSGLSKIIN-----
FIGCWLPLTAVNLKDYKIEPFLRAQPFWPLV-AHVIA MSTVIWNP LFFWLTKRQ--KRSGLSKIINSS-EVVASFASRLGNSLRMRSSRNSD---K
FIGCWLPLTAVNLKDYKIEPFLRAQPFWPLV-AHVIA MSTVIWNP LFFWLTKRQ--KRSGLSKIIN-----
FIGCWLPLTLNLKDFKKEPEFLKQPFWPLV-AHVIA MSTVIWNP LFFWLTKRQ--KRSGLSKIINSS-EIVSFASTRVNSIRRTSIFRRN----N
FILCWFPITLYNITKDFSK---LHSQPFYGVV-FHSTAMSTVVLNPLFFWLTKRQ--KRSGLSKIIN-----
FILCWFPITLYNITKDFQVEPAFMTAQPFLWPLV-AHVIA MSTVIWNP LFFWLTKRQ--SHLGGILHTS-EIITSLT SRMQSIRSTA--GDSVRLGS
FIGCNTPITAVNLKDFKQEPFLKQPFWPLV-AHVIA MSTVIWNP LFFWLTKRQ--KRSGLSKIINSS-EIITSLT SRMQSIRSTA--GDSVRLGS
FIGCNAPLTAVNLKDFGWEPEFLLRQPFWPLV-AHVIA MSTVIWNP LFFWLTKRQ--KRSGLSKIINSS-EIITSLT SRMQSIRSTA--GDSVRLGS
FIGCNTPITAVNLKDFKQEPFLKQPFWPLV-AHVIA MSTVIWNP LFFWLTKRQ--KRSGLSKIINSS-EIITSLT SRMQSIRSTA--GDSVRLGS
FIGCNTPITAVNLKDFKQEPFLKQPFWPLV-AHVIA MSTVIWNP LFFWLTKRQ--KRSGLSKIINSS-EIITSLT SRMQSIRSTA--GDSVRLGS

Consensus FIGCWLPLTVVNLKDFK EP FL QPFLWPLV AHVIA MSTVIWNP LFFWLTKR KRSQ L RIS S S ISRI SM R S

B. malayi NPR-5 WHRCIPESFDGTYCSMLNREPPSSRNDMOKSHLRNGLTNSKNYLTIEAERLI-----
W. bancrofti NPR-5 WHRCIPESFDGTYCSTLNREPPSSRNDMPKSHLRNGLTNSKNYLTVEAERLI-----
D. immitis NPR-5 ----YIFRYDDIYCSSLNRRSSNRSNSTKHLRNGSANSKNYLTVEMERLI-----
O. volvulus NPR-5 -----
O. ochengi NPR-5 -----
L. loa NPR-5 ----YNSTYN--SAGTLNRESPNRNETPKSHLRNGLANTKNYLSVKTERLI-----
A. suum NPR-5 ---TFRSQSS--ATTKVIKRQEAVDETPGSRTRPLLVTDGDRTSIARSASLSRTIL-----
A. caninum NPR-5 -----
N. brasiliensis NPR-5 TEKTKKRNGAVDSEVIVGCSATSRPLIIRAEIMTASS-----
H. contortus NPR-5 -----
C. elegans NPR-5 IDRVRKKQVVLDCGSS-YTTSSRPLLIRTDVQATLSNGSTSTTREML-----
S. ratti NPR-5 -----
B. xylophilus NPR-5 TRIRRRTPSEKCCSRN--NSVQSRPLIVSQTDNGITPTALLTKASSMENNML-----
G. pallida NPR-5.1 KRMNKRALQLQRCEASGSRRTANGTSIRLGQSSALPLSQPLLLRENGHTATVHSRTDSSRNPSGMVEGRRSPLAKAYSLRANSVL-----
G. pallida NPR-5.2 IRRLSRGELTAAEPNLGQQRERKNIPMVAHFNRKLLENGKMSSKDSVDSLVPVANSKMFDPGYERKLPKHAGENPSLVVFNRRRMSTNSNTF
M. hapla NPR-5 RYKRRFGRKAARHLYRAESETTTS---RRPVLANGLTFSDSLRLNGYGGDTQWVRKNKLFKNNNYPLKG---SNASINYIPKWTSKI-----
M. incognita NPR-5 RYKRRFGRKTARHLYRAESETTTSSTRRQILSNGLTFSDSL-----

Consensus

L GL

6. NPR-6 homologues

T. spiralis NPR-6 -----MVGIIIFNRRLOSVTN-FFICNLAV
T. muris NPR-6 -----FVYLILYAFVLLMAFCCGNLLVYIIVMRRRLQNVTN-FFICNLAV
A. suum NPR-6 -----RLVFGIAYMLIFTLAVS GNSLVVYVVV INNKTMQTVTN-IFITNLAI
C. elegans NPR-6 -----MSNDLVPSVSSILNETTPSYQSTCKIKNNPMEMEYFPPFFISMYCAVFLVASSGNFLVYVVV TNKRMQITN-IFITNLAV
S. ratti NPR-6 -----FVLYLFIYLLIFIVAVTGNLSLVYVVVTKKSMQTVTN-IFITNLAI
B. xylophilus NPR-6 -----YTTVFLISFI GNATVVYVMVIRAKTTNVMN-LLITNLAV
G. pallida NPR-6 -----AITDLVLTLSLFLIAYLSLFFVGLIGNFLVWVVVATC-----VFIANLAV
M. hapla NPR-6 PYRRYYYRITDPPTCFQVAIAAMTIFYIFHHKFQALLSVAQARRLVALTDLLLT VLFMIAYPSLFFVGTVGNLLVWVVV SCCKMQTVTNVFIANLAV
M. incognita NPR-6 -----PPTCS--PTLAIPIFYISHHKFQALLLVAQAKRCVLTDLLLT VLFMIAYPSLFFVGTVGNLLVWVVV NCKKMQTVTNVFIANLAV

Consensus R LFLI Y IFLVA GN LVVYVVV KKMQTVTN IFI NLAV

T. spiralis NPR-6 SDLFLVTLTSLWLTTPMYGYLCKWIWGA VMCHSLPVIQ GASIFINSFTLTAIALDRYIVILNPFKKR-----MKMKVCFGLI LAIWI L SLLLV APYGFHMD
T. muris NPR-6 SDLFLVSLTSLWLTTPMYGYLGRWIWGSVMCHSVPVIQ GASIFISSLT LTAIALDRYIVILNPFKKR-----MTVKVCLTIV I S IWLFS LMLV APYGLHMD
A. suum NPR-6 SDLLVNFTSLWLTPLYTYT YGHWIWGGWLCYGLPLPFGQTSIFISLT LTAIALDRYIVIVHSSS-PNVNDHMSMQVCIAT I LIWT V SLLLV MPYAVHMR
C. elegans NPR-6 SDLIVNFTSLWLTPLYTYS IGHWIFGGGLCHLPLPFGQTSIFISLT LTAIALDRYIVIVHSSN-ININDRMSMRSCLSFVLIWLC SLLLVTPYALNMK
S. ratti NPR-6 SDLLVNFTSLWLTPLYTFLGRWIWGGWLCYGLPLPFGQTSIFISLT LTAIALDRYVICRHGAVINANDHISMHVSI-ITVIWAF SLLLVMPYALHMR
B. xylophilus NPR-6 SDFLVCI TSLWLTPLYWYTGQMMWGTTCHEFFPLPQGLSICNSSMTLLVIAVDRYIVVCKNQDSYKAFNLTTKQCKFVIAF IWS IATLVM PYALNMK
G. pallida NPR-6 SDLIVCCTSIWLTPYTYT YGHWIWGA VMCYALPLPFGASIFISSLT LTAIALDRHWVITSWANS-----PQVCAAVI CLIWCLS VLLVLPYAVHMR
M. hapla NPR-6 SDLLVCFSSIWLTPLYTYT YGHWIWGGWLCYSLPLPFGASIFISSLT LTAIALDRYVVICLAPPNRSATOMHTSKQVCIAVI CLIWCVS ILLALPYAVHMR
M. incognita NPR-6 SDLLVCFSSIWLTPLYTYT YGHWIWGGWLCYSLPLPFGASIFISSLT LTAIALDRYVVICLAPPNRSATOMHTSKQVCIAVI VLIWCVS ILLALPYAVHMR

Consensus SDLLV FTSLWLTPLYTYT YGHWIWGGWLCYSLPLPFGASIFISSLT LTAIALDRYVVI R N MSMQVCIAVI LIW V SLLLVMPYAVHMR

T. spiralis NPR-6 LYH[A-ECDIYICRELWE-FHEFOAYGFSVMALQFGIPFLITVICYLRIWFHFKRKMVILQLK-SDQALORRKRLLKMLITMVAIFGLCWLFPFNILNLL
T. muris NPR-6 LHYSPPQDFHICRELWE-FGELQAYGFTVMVLOFGIPFVIAVCYIRIWHHLCTRKSLVHLK-SDSALKRKRLLKMLIMVSI FGLCWLFPFNILNLL
A. suum NPR-6 VTYIPRPFCEFWLCEDEWA-MEDLKS MYGVIMALQ-LVPPFVIGFSYIQIWNFLNNSMVSQRESEYENARKKRLLRMLIIMVVVFGICWLPFNILNLL
A. caninum NPR-6 LTFITPEPCNFVWCGEDWS-MKRIKSLIYGVIMALQFIVPFVIGISYHSIWSFLNGRRRLTRER--AVETLRKKRLLRMLIIMVVIFAVCWFPFNILNLL
C. elegans NPR-6 LNYIHEPCDFLICEDEWS-NAEFRSIFGIVMILQFVLPFLIAISYIKIWLFLNSRQSMTERK---SDLRKKRLLRMLIIMVVIFAI CWFPFNILNLL
S. ratti NPR-6 LTKFKKPCCFWVCEAWA-MEDLKSAYGLVIMILQFIVPFVIGFSYIKIWKFLNRRKSLVTERESEIETORKKHLLRMLIIMVVIFAI CWFPFNILNLL
B. xylophilus NPR-6 LKSSNLGHIYKCEDEWS-TGSTRAVYGLVVTMFOFVLPFLIFGFSYMKIFMFL-QRQCQESNNRLRVVSNKKNALFRMLFV MVVIFAVCWLEVNILNVM
G. pallida NPR-6 IAEVMPPCRFSLCVEDWGGKEDMRSLYGVITVVLQFVVPFTVIGHSYRRIRWFMEARRLRQSE-SDVQLMRKRLLSMLVRMVLVFGICWLPFNILNLL
M. hapla NPR-6 IAQVQWPCFSLCVEDWVDLEDLRSVYGVITAILQFVLPFAIIGRSYRLIWRFLIETRRAQLRPISEAQMNRKQRLRMLVRMVLVFGCCWLPFNILNLL
M. incognita NPR-6 IAQVQWPCFSLCVEDWVDLEDLRSVYGVITAILQFVLPFAIIGRSYRLIWRFLIETRRAQLRPISEAQMNRKQRLRMLVRMVLVFGCCWLPFNILNLL

Consensus L V PCDFWLCVEDWS MEDLRSVYGVIVMILQFIVPFVIGFSYIKIWF L RRSLL K SE LNRKKRLLRMLIIMVVIFGICWLPFNILNLL

T. spiralis NPR-6 RDMPSHEDGKSYFVFLFLVSHLIAMSSSSWNTVLYAWMNYHFNREFRPWHPGSWQMSQNKMTNCIKWLKRVTEAITTFLTLVETQILIDCMLQKHIIF
T. muris NPR-6 RDLSPGAIDAKSYFVFLFLVSHLIAMSAAGWNPVLYAWMNDNFSREYRYIFYFLCGRK-----
A. suum NPR-6 RDLHLDSSTKPYFSFLFLSAHVLSMTATCWNPIVYAWMNDAFREFRVAAVFL-----
A. caninum NPR-6 RDLHWDDFIRP-HFSFTFLIVHLLSMTATCWNPIVYAWMNDSEFR-----
C. elegans NPR-6 RDLKLDNEMRG-YFSEVFLSVHLLSMTATAWNPILYAFMNETFREEFKAVVPCLFARRPGTGPIRVITERTAMITNPFRRANRKKKVEEQPVTVISESPL
S. ratti NPR-6 RDLRLDDGFKQ-YFPPLFTSHVLSMTATCWNPIVYAWMNESEFRKEFTHAIPFLQKHFQLNAKNNHRARVITDCQPALIRVNCKDNNKQK-----
B. xylophilus NPR-6 RDLGLDQLILGRQGIWFNRAHMLSMTCVMVNPLIYAFMNHFRDEFCEVFP-----
G. pallida NPR-6 RDLHADAFIKV---SFLFLFAHLLSMVVPAANPLIYAWMNASFRDGFRLRVLP-----
M. hapla NPR-6 RDLRMDAWLKP---SFLFLLAHLLSMVVPAANPLIYAWMNASAFRESFLRALP-----
M. incognita NPR-6 RDLRMDGWLK---SFLFLVSHLLSMVVPAANPLIYAWMNASAFRESFLRALP-----

Consensus RDL LD FIK YFSFLFLLAHLLSMTATAWNPILYAWMNDAFREEFLR LP

T. spiralis NPR-6 KKYCCKVLRLELNAQLLNGENAVNQWICQKPFYKMSKKFSSVKLKLII
T. muris NPR-6 -----
A. suum NPR-6 -----
A. caninum NPR-6 -----
C. elegans NPR-6 QTAVEPQRSIVYLDEPENGGSSCQTLLE-----
S. ratti NPR-6 -----
B. xylophilus NPR-6 -----
G. pallida NPR-6 -----
M. hapla NPR-6 -----
M. incognita NPR-6 -----

Consensus

7. NPR-8 homologues

T. spirallis NPR-8 -----AEQCFL-----QNSGSEVGEN-FWKECLR-----QARFQLFTTFAAFFTAAYSICGVGLLSNGLLIYVLF
T. muris NPR-8 -----AEKCFE-----ERGFPEHDDD-FWKACLRN-----LAITRVFTDVEATLFTVAYSILCGTGLLSNGLLIFVLF
A. suum NPR-8 -----MFMSIDDIDAQCPRGIDKGVVTANERKAPFNLCLO-----LRRYSEWEEVYTAIYMVISVLAVINGGVVILAVI
C. elegans NPR-8 MDFINELFFTDTDIEDLGMIMEVKDIDNYDRG---ISPNASNYLTPFDGLCLQK-FFYQLQTSLRRFTPYEEIYTYTIVYIISVAAVIGNGLVIMAVV
B. xylophilus NPR-8 -----MFMSIDDIDRRCPRGINASLVSDTSLQAPFDDACLFOFTFFQRNAHLRKYNEWEEMLYTFLYFLISFFALVNGVIVLAVI
G. pallida NPR-8 -----FLTVDLNRKCPRD-GLPAEDQQRWLSHPFDSCIR-SFFLGLSAQLRRYEHWEWFYIYAMALISALALIGNGMVILSVI
M. hapla NPR-8 -----MFLSVEDIDRQCPR--AVNPNDTNNWQTFPDDCLKS-FFHKLTAHLRRYIYETAAYTSFYVLISICATIGNGLVILAVV
M. incognita NPR-8 -----EMFLSVEDINROCPR--AVNPNDTNNWETFPDDNCLKS-FFHKLTAHLRRYIYETAAYTSFYVLISICATIGNGLVILAVV

Consensus MFLSVDDIDRQCPR N W T PFDD CLR FF L A LRRYT WEE LYTAIYVLISI ALIGNGLVILAVI

T. spirallis NPR-8 ASLKRRNPGDVFTINLALSNFLLAALYIPFLWLPVNEGDFTHGLFFCKFANALPGSNIFCSTLTIAVMAVDRIYAVVNMNKQ--ISTRNNYFALLVAGL
T. muris NPR-8 SDLKLRPSDVFLNLALSNFLLAALYIPFLWLPVNEGDFTHGLFFCFRANALPGSNICYSTLTI SVMAVDRYQVNMERHS--VSAQRHISVLVAGL
A. suum NPR-8 RKRMRTRNRVLIIVNLALSNFLMLALTTIPFLWLP SIDDFEFLYSRFFCKFANALPGSNICYSTLTI SVMADRYYTVKMYAS--SHRROCLRAVCLISIL
C. elegans NPR-8 RKRMRTRNRVLIIVNLALSNFLMLALTTIPFLWLP SIDDFEFLYSRFFCKFANVLPGSNIYCYSTLTI SVMADRYYSVKMKIAS--NRKQCFHAVLVSLA
B. xylophilus NPR-8 RKRMRTRNRVLIIVNLALSNFLMLALTTIPFLWLP SIDDFEFLYSRFFCKFANALPGSNICYSTLTI SVMADRYYSVKQMNVG--TVNQTCVKGIIISVM
G. pallida NPR-8 RKRMRTRNRVLIIVNLALSNFLMLALTTIPFLWLP SIDDFEFLYSRFFCKFANALPGSNICYSTLTI SVMADRYYSVRSLNISSSSARPGQCTRALFISFL
M. hapla NPR-8 RKPAMRTARNVLIIVNLALSNFLMLALTTIPFLWLP SIDDFEFLYSRFFCKFANALPGSNICYSTLTI SVMADRYYSVRSIKVAGPSSRSGNCRALLISVL
M. incognita NPR-8 RKPAMRTARNVLIIVNLALSNFLMLALTTIPFLWLP SIDDFEFLYSRFFCKFANALPGSNICYSTLTI SVMADRYYSVRSIKVAGPSSRSGNCRALLISVL

Consensus RKR MRT RNVLIVNLALSNFLMLALTTIPFLWLP SIDDFEFLYSRFFCKFANALPGSNICYSTLTI SVMADRYYSVK MKVA S NCVRALLISVL

T. spirallis NPR-8 IWVVALALSLPYLLHYNLSFRFPLEIYARFNKTEE----IILFTTCTLRPQSCVDSGLNAED-----E-----KRCTEQVELVISILQAVFLYL
T. muris NPR-8 IWLLAFALSLPYLLNYDLRIVVFPLEIYAQRFNKTEE----IVLFTSCALRPSSCIDSGLNPEE-----E-----KSCIQQVELVVSILQAVFLYA
A. suum NPR-8 IWIISFLLSFPLLYYDTTMLYVFKDVTVFSSG-----NATKLSYGWQRCLAPTQRKGMEDPN--EAAKRESDAQKQVLFMSVMQALFLYV
C. elegans NPR-8 IWIVSFILSLPPLLYYETSMLYVREIRVVDQS-----GQEVTRSYGWQRCLVVSAG-----RLPDITQSTQLLMSILQVAFLYI
B. xylophilus NPR-8 IWVFSFLLSFPLLYYDTTMLYVFKDVMVYDSER-----NTITQLSYGWQRCLSPGGSAADDLNSIDADAQARMIQHFLQVMSLMQVFLFLYV
G. pallida NPR-8 IWVFSFLLSFPLLYYRVEHLYVFKDIYKYDTSANGHSTSANFSSQIVLQSYGWSQCRISTG-----VQLGMAAMQAVMLYA
M. hapla NPR-8 IW-----YYQINMLYVFKDVYVLKENIQ---SEGNSSSVELSYGWQRCL-----LGMSLMQALMLYA
M. incognita NPR-8 IWVLSLLSFPLLYYQINMLYVFKDVYVLKEESK---SEGNSSSVELSYGWQRCLQ-----LGMSLMQALMLYA

Consensus IWVLSFLLSFPLLYYDI MLYVFKDV V S SS LRSYGWQRCL Q VQLVMSLMQALFLYA

T. spirallis NPR-8 VPLLILVYCVKLTIFLHKADRRRLRLGRRKNHP-----PPP-----PPITASGG-----IIEAGPVKTPARSTR-----
T. muris NPR-8 IPLIVLVVYCKLTHFLQNEQR---IKQQRGLTK-----DKL-----LGCALDKD-----GKLPSAGAHNRNR-----
A. suum NPR-8 VPLIVLLIFNAKLTRFLQNSRQHRSLSDGRSDA-----GTLCLVKSSDLGQTAIVR-----NLPARRMNVKRR-----
C. elegans NPR-8 VPLFVLSIFNVKLTIFLKTNAKNNKSKTRAPPKRFDRSDSHHNSLKNNNHTSSLRPS-----MPSIRSSITERNKINQRT-----
B. xylophilus NPR-8 VPLVVLISIFNVKLTIFLKTNAKNNKRNRRNGTLRRES---VMIQCNKSNYAVKEPKKTRNALSLETEISTSTPPTPRVESATPERASDRRR-----

G. pallida NPR-8 VPLVVL^SIFN^MKL^TRFL^KMNA^KQ^LKQNSERECDSVG---VAMERR^RQ^RGGSKA^SSMGGVTQRSS^IATSELMLPRQV^SIVTIGAS^SR^AE^KR^S-----
M. hapla NPR-8 VPLV^VLLIFN^LKL^TRFL^EKN^SKN^MN^RL^LPKVSI^SATQ^QNR^VEK^VDRRTSDNESL^LCAEKL^MENSDG^QQKGANSTK^VSS^LVSGGAV^SAVT^TNNL^RKSSGGA
M. incognita NPR-8 VPLV^VLLIFN^LKL^TRFL^EKN^SKN^MN^RL^LPKISVSATQ^QNR^VEK^MDRRTSDNESL^LCAEKL^IENSDG^QFKGANSTK^SGS^LVSGVAV^SST^TNNL^RKSSGGA

Consensus VPLV^VLLIFN^LKL^TRFL NAKNMN L R V RS SS IV A A A T R R

T. spirallis NPR-8 -----AIK^LL^FAMA^SSYA^LV^WMP^FEVLS^IY^THL^RSSHWTE^DTV^KVM^RVD^QAF^KL^ITV^LS^IC^INP^ILY^GFL^NKN^LN^KR-----
T. muris NPR-8 -----AIK^LL^FAMA^SSYA^LV^WMP^FQGL^SL^FIS^LRSSDWPED^TVAF^RRI^DEAF^KL^IS^ML^SI^CIN^PV^IY^GFM^NKN^LSKR-----
A. suum NPR-8 ---NR-----TTALLIAMAGSYA^LVL^WLP^FTV^VS^MLL^DLR^LLYMEGNAA^VI^ER^ID^QS^CK^MI^SI^MS^IC^VNP^FLY^GFL^NTN^FRHE^FT^DI^FNQ^WI^CYKLRTP
C. elegans NPR-8 ---NR-----TTSLLIAMAGSYA^LAL^WFP^FTL^IT^FLID^FELLINQDYVN⁻L^VE^RI^DQ^TC^KM^VS^ML^SI^CV^NP^FLY^GFL^NTN^FRHE^FS^DI^YY^RI^RCETKSQ
B. xylophilus NPR-8 ---NR-----TTMLLIAMAGSYA^LVL^WFP^FTL^VS^MLID^MDL^LYLEN⁻GA^AI^ER^ID^QS^CK^LI^SI^LS^IG^VNP^FLY^GFL^NTN^FRHE^FT^DI^FNS^LI^RCSASQR
G. pallida NPR-8 ---NR-----TTALLIAMAGSYA^LVL^WLP^FTL^VS^ILID^LD^LW^LG^VES⁻G^SP^IE^RI^DQ^TC^KL^LS^IT^SI^CV^NP^FLY^GFL^NTN^FRHE^FN^EI^FSY^CLAWMPTLT
M. hapla NPR-8 LINNQKRRNK^TT^TSLLIAMAGSYA^LFL^WFP^FTL^IS^VLID^LDL^MVNI⁻---M^ER^VD^QA^CK^LI^SI^LS^IC^INP^FLY^GFL^NTN^FR^SE^FN^EI^FI^KC^LI^HC-----
M. incognita NPR-8 LINN-----SLLIAMAGSYA^LFL^WFP^FTL^IS^VLID^LDL^MVN⁻---M^ER^VD^QA^CK^LI^SI^LS^IC^VNP^FLY^GFL^NTN^FR^SE^FN^EI^FI^KC^LI^HC-----

Consensus NR TTSLLIAMAGSYA^LVL^WFP^FTL^IS^LLLID^LDL^L IIERIDQACKLISILSICVNPFLYGF^LNTNFRHE^F DIF I C

T. spirallis NPR-8 -----
T. muris NPR-8 -----
A. suum NPR-8 TNVQQEYSTIASPRRQSSSHSPQVSTSNRFLHLLQNPYVRRSSAPCSSFIRTSIARLT-----
C. elegans NPR-8 PAGRFHHDVSSIAHHRQDSVYNDEATLLT^TGRQSN^GKDGSSSPI^GFRSSV^RVC^SGQTKMIGDRIVLDDDDIEKDSFV
B. xylophilus NPR-8 P-----
G. pallida NPR-8 MREGRQRETSSSLGADRK-----
M. hapla NPR-8 -----
M. incognita NPR-8 -----

Consensus

8. NPR-10 homologues

T. spiralis NPR-10 MTRAEVESTLLLIKAPLVVNADSRQLLPAVSQNSCVEYSDYVVEIHKDITREGVWRGIFLICYLWIFLAGITGNVCVIISVARKASLQSVRNLFIVLSLSC
T. muris NPR-10 -----CTDYGFFAYETYGDITREAWRGIIFIFVYVLIIVVAGITGNVSCVIIISVARKAFVLSVRNLFIVLSLSC
B. malayi NPR-10 -----TQTPCVDINEYLWMMHSDLTSLLLPTMIFFAIYGLIILS-----LIR---HKSLQSVRNLFIISLSV
W. bancrofti NPR-10 -----CVDINEYLWLNHSDLTSLLLPTMIVFAIYGLIIIQ-----SVRNLFIISLSV
A. suum NPR-10 -----NTTPECIDIKEYLWKNQSDLTSLPSTMSVFAVLYSFIITLGLVIGNTLVVLSVIRHKSLQSVRNMFIIVLSV
C. elegans NPR-10 -----MSSSNHCIDIRAYLWQTKHDLTLHPITAILLATIYTIIVVVGWITGNLLVVMVMRFVQLQSVRNMFIIVLSV
S. ratti NPR-10 -----QMINESKVCKSVDNDLRENFNDVTTQPLIMIFISIFVYLLIIVVGVVGNLSLVIISVLQNKILQSVRNFIVALS
B. xylophilus NPR-10 -----LSKSANCVDIKAFLWTSQGDLTSLPSTMLIFLIYGLVINGG--LVIIVLIIISVIRHKSLQSVRNLFIVLSLSC
G. pallida NPR-10 -----KAYLWAGHSDVTSVLPVMLLFGLIYTTIIVTSLILGNLLVIFSVQCHRSLQSVR-----
M. hapla NPR-10 -----MEQQPETAIDSIYSTQFVNTNDDKCIDIKEFLWTSNSSLTSLPIMVGF AFLYSAILVLTSLGNLLVILSVQYRSLQSVRNLFIVLSV
M. incognita NPR-10 -----MEQQFINTEEDQCIDIKEFLWTSNSSLTSLPIMVGF AFLYSAILVLTSLGNLLVILSVQYRSLQSVRNLFIVLSV

 Consensus CIDIKEYLW N SDLTSLP IM IF IY IIII ILGNLLVILSV HKSLQSVRNLFIVLSV

T. spiralis NPR-10 SDIVVCLTSLPITPITIIIRKNWLFGLPLCYIFPILLQCMSTIISTFTLMAIAIDRFILIIYPTKPIINRCHATTMIVAIWTLAISISIPMLLHYNLYKLPY
T. muris NPR-10 SDIVVCLTSLPITPITIMKKNWLFGLPLCYIFPILLQCMSTIISTFTLMAIAIDRFILIIYPTKQPIQKRHAVAMTVSIWTLAGGISIPMLLHYNLYKLPY
B. malayi NPR-10 TDIISIVSGTITPITAFSKIWLFGELLCYFIFLQFQASLCFSSLTLTAIAIDRFILIIIFPTKRPQKQRAIKIIGLDFALATAISLP-----MFI
W. bancrofti NPR-10 TDIISIVSGTITPITAFSKIWLFGELLCYFIFLQFQASLCFSSLTLTAIAIDRFILIIIFHTKRPQKQAVKIIIGLNFALATAISLP-----MFI
A. suum NPR-10 SDIVISIVSGSITPITAFTKIWLFGFELCYLVLPLQFQASLCFSTLTLMAIAIDRFILIIYPMKRPQKQVHALWMIALNITLATAISMP-----MFL
C. elegans NPR-10 SDIFVAIVSGSVTPITAFSKVWLFGGPLCHLLPLLQGTAFSFTLTLTAIAIDRFILIIICHTPKPIRQDQALKMISFNATISVGLSVP-----LFM
S. ratti NPR-10 SDIIVCVVSGSFTPISAFSKTWLFGFELCKKLVPLQGVSLFSTFILASTAVDRFILIIIFPTTQPISSKLAIVMISYIFIGSILTKP-----LYD
B. xylophilus NPR-10 SDIVASLVSGSVTPISAFTKIWLFGFELCKKLVPLQGVSLCFSTLTLTAISIDRFILIIYPTKRSIQTKHALRMIALNCLLATSISLP-----MVF
G. pallida NPR-10 -N-----MFAFSKIWLFGFELCKKLVPLQGVSLCFSTLTLTAISIDRFILIIYPTLRQSIQKRCACRIVALNSAIALIISLP-----MLF
M. hapla NPR-10 SDIVICVSGTITPITAFTKIWPFGFELCKKWVPLQGVSLCFSTLTLTISVDRFILIIYPTLPSIQKCCACRIVALNCAIALAVSFP-----ILF
M. incognita NPR-10 SDIVISVSGTITPITAFTKIWPFGQLCKKWVPLQGVSLCFSTLTLTISVDRFILIIYPTLKPISIQKCCACRIVALNCAIALAISTP-----ILF

 Consensus SDIVISIVSGSITPITAFSKIWLFGELCYLVLPLIQGVSLCFSTLTLTAIAIDRFILIIYPTKPIQK ALRMIALN AIA AISLP M F

T. spiralis NPR-10 HDGNVTWVYCGYFCDETWPNLE--ARQAYGSIVLVLOFIIPLIVITFCYASISLRVGVKVALRQG-----
T. muris NPR-10 ERKANHTIWCYGFCDETWPNVE--ARQIYGGAVLLLOFIIPLIVITFCYGGIFIQVIKGVAFKQTT-----
B. malayi NPR-10 KORFIKYENFCGQFCTEDWSSDN--MGRSIIYGTIVVFIQFVAPLTIIFFCYTMISLKLTKTTLTKKQI-----
W. bancrofti NPR-10 KORFIKYENFCGQFCTEDWSSDN--VGRSIIYGTIVVFIQFVAPLTIIFFCYTMISYR-----
A. suum NPR-10 MOKLVDYGNFCGQFCTEDWGNNE--FGRSTYGTIVVFIQFVAPLTIIFFCYTMISLKLKGLLVKQAS-----
C. elegans NPR-10 KOELMQFRNYCGEYCSFNWGPDA--YLRSVYGTIVVFIQFVAPLTIIFFCYTMISLKLKGLLVKQAS-----
S. ratti NPR-10 ENTLESYKDYCGKICYEKWNGNE--DGRKRYGTIVVFIQFVAPLTIIFFCYTMISLKLKGLLVKQAS-----
B. xylophilus NPR-10 KOKLVDYGFCCGQFCTEDWKEDT--FARSAYGTIVVFIQFVAPLTIIFFCYMMISIRLQGGILVKDRN-----
G. pallida NPR-10 TOKLDTYDRFCGQFCSFYWDGELGAVARSAYGTIVVFIQFVAPLTIIFFCYMMISIRLQGGILVKDRN-----
M. hapla NPR-10 NQTLVDYPPFCGQFCTEDWSSNSN--IQRSLYGTIVVFIQFVAPLTIIFFCYMMISIRLQGGILVKDRN-----
M. incognita NPR-10 NQAMVDYPPFCGQFCTEDWSSNSN--IQRSLYGTIVVFIQFVAPLTIIFFCYMMISIRLQGGILVKDRN-----

Consensus QKLV_Y FCGQFCTEDW ARS YGTVVFILQFVIPLIIITFCY MISIKL KGV VK S

T. spiralis NPR-10 -----GKMLLSNGAGAPDALLTRHVAALKRRQRTNRMLISMVAVFVACWFFQVLLNVLRDFNATPLAIASQPYLSSLIIVHCIAMSS
T. muris NPR-10 -----DHRLLPMNGVSSEVILLRQMAIRRRQRTNRWMLISMVAVFVACWFFQVLLNVLRDFSAIPSPIAAQPYLFSLIIVHCIAMTS
B. malayi NPR-10 -----FYRQQVLKRRRLRTNRMLIAMVGVFVCCWMPAVVFNFLRDYHWLPNFISQQEYLYLIGIITHCISMSS
W. bancrofti NPR-10 -----QQ---VLKRRRLRTNRMLIAMVGVFVCCWMPAVVFNFLRDYHWLPNFVFSQ-EYLYLIGIITHCISMSS
A. suum NPR-10 -----K-----HASGLG---TEQRRLALQRRLRTNRMLIAMVGVFVCCWMPAVVFNFLRDYHWLPSFVAQQEYLYLFGIITHCISMSS
C. elegans NPR-10 -----K-----E-----LMSEARRQLTQRRLRTNRMLIIMTVTFALS~~W~~LPVSGFNFLRDYSALPGIIDSQDYLYLFGIIFHCISMIS
S. ratti NPR-10 -----KNNR-QRTNRMLIAMVGVFVCCWMPAVVFNFLRDYQKLPITIQKQEYLYLFGIITHFISISS
B. xylophilus NPR-10 -----T-----DQQQLTQQQSEQRK~~T~~ALKRRRLRTNRMLIAMVAVFVLCWTPAVLNFNFLRDYQWLPNVVARQEYLYLFGIITHCISMSS
G. pallida NPR-10 GTEECTLLLTNGTND~~A~~HSGTPTGNHANDVLMAMEQKHALNRRRLRTNRMLIAMVAVFVCCWAPTVLNFNFLRDYQWLPK~~F~~VLSQEYLYLFGIITHCISMSS
M. hapla NPR-10 GTDEGNSLYIN----EQKQNGMLMAGDGAMKVAMDQRKMVLSRRIRRTNRMLIAMVAVFVCCWAPSVIFNFLRDYQWLPK~~N~~VVAQEYLYLFGTSTHCLSMSS
M. incognita NPR-10 GTDEGNSLYIN----EQKLQNGMLMAGDGAMKVAMDQRKMVLSRRIRRTNRMLIAMVAVFVCCWAPSVIFNFLRDYQWLP~~N~~FVIAQEYLYLFGTTHCLSISS

Consensus EQRK VLKRRRLRTNRMLIAMVAVFVCCW PSVLFNFLRDYQWLP FVAAQEYLYLFGIITHCISMSS

T. spiralis NPR-10 TLWNPILYAWLNDTFR~~T~~AFFYEILPFVSVLCCISKPAAMEG-RFRSDSIID-----
T. muris NPR-10 TLWNPVLYAWLNE~~S~~FR~~T~~AFF~~E~~ILPCV~~R~~VLCCAKRPHINDFSLYRAASVAE-----
B. malayi NPR-10 TLWNPCLYTL~~L~~NDQFRMAFLDL~~L~~HSFRIVP-----
W. bancrofti NPR-10 TLWNPCLYTL~~L~~NDQFRMAFLDL~~L~~QSFRIV-----
A. suum NPR-10 TLWNPCLYALLNEQFR~~L~~AFV~~D~~LLQYCRSGQKRCGTRYTDARCSRLVSNAPLANNSITEENIKLPNSV--
C. elegans NPR-10 VLVNPFLYGYCNEHFR~~A~~AFAAL~~L~~DTVK~~A~~ACGMRRVSPGNPACSQLLSTHFESTTRRSVTTTIPSSI-----
S. ratti NPR-10 TLWNPCLYALLNVQFR~~T~~AFFSQILGHTT~~S~~VTLNERNK~~N~~LEMK-----
B. xylophilus NPR-10 TVWNPILYTMLNEQFR~~L~~AFAE~~F~~FKLCRPRKPR-GLRYKSANGSNESRTINTK~~L~~KSARFSNTPTI-----
G. pallida NPR-10 TLWNPVLYALLNEQFR~~A~~AFSE~~Q~~FKQLRHRFCLPCRDSTNSGRNRLGTM~~D~~NNGSTSA~~A~~QQQSCRGSI~~R~~LVSIPTPSLIKFEH~~S~~VVR
M. hapla NPR-10 TVWNPVLYALLNEQFR~~L~~AFSE~~I~~FKQIGNYFGIKQEMKVPQM~~Q~~GR~~L~~RRIKV~~K~~SDV~~K~~RGSEI-----
M. incognita NPR-10 TVWNPILYALLNEQFR~~L~~AFSE~~I~~FKQISNYLGIKKERKMLHM~~Q~~GLKRIK~~V~~RS~~D~~VQ~~R~~GSEAI-----

Consensus TVWNPILYALLNEQFR~~L~~AFSEIL IR

9. NPR-11 homologues

<i>B. malayi</i> NPR-11	-----N ^K V ^D C ^T VAKW ^K Y--LILQLC-----WCITAAAYVV
<i>W. bancrofti</i> NPR-11	-----MNIW ^E Y--LILQLC-----WCITAAAYVV
<i>D. immitis</i> NPR-11	-----Q ^L C-----WCITIAAYII
<i>O. volvulus</i> NPR-11	-----MKDDCDEWREIF ^T FR ^I DSYFR ^D DI ^V LEGE ^T EYSKTCIFQLC-----WCITVAYYII
<i>O. ochengi</i> NPR-11	-----FIEVSLKITYFRSLKRRNFWDIMNLTSM ^E KKN ^E YSKTCIFQLC-----WCITVAYYII
<i>L. loa</i> NPR-11	-----MPSIRMKDNCDEWRQIF ^T FR ^I DSYFR ^D DI ^V LEGE ^T IN ^H ---ASAQLC-----WCITVAYYVV
<i>A. suum</i> NPR-11	-----MPNSTLAEKDCNQWQHMFSE ^I NSYFR ^N EI ^V LEGE ^T DH ⁻ ---ASVELC-----WCITFAYCF
<i>A. caninum</i> NPR-11	-----
<i>N. brasiliensis</i> NPR-11	-----NETCEHYQNLFSR ^I NH ^Y FR ^D DI ^V LDGA ^E HA ⁻ ---SKELC-----YAITAAAYLV
<i>H. contortus</i> NPR-11	-----NETCEHWQSLFGR ^I NH ^Y FR ^D DI ^V INGTEHASKKVG-----YAITAAAYLV
<i>C. elegans</i> NPR-11	-----MGSVNESCDNYVEI ^F NK ^I NYFR ^D DI ^V INGTEYS ⁻ ---PKEFC-----YFIFTAYML
<i>S. ratti</i> NPR-11	-----SCAQAEVEFK ^L NY ^F VDEP ^L I ^A NHKRAPG-----VI ^I AFAYSM
<i>B. xylophilus</i> NPR-11	-----MADPNRSNSSEPSEARTCAQWERLFSAT ^N H ^Y FR ^D DI ^V LQGE ^S EHS ^S SVESG-----YVVAAYVL
<i>G. pallida</i> NPR-11	-----MSGDGMTPNRTGQQNCGELET ^L FDG ^N E ^F FR ^E ET ^L LQGE ^S EHS ^S ILASPRESEELMNF ^G IFQLGNL ^L LSAY ^L L
<i>M. hapla</i> NPR-11	MSDVLDINAYNNSENDASYKVASSILILSEQPQLQE ^N QVKS ^C CHEMET ^L FSGL ^I NN ^F FR ^D DI ^V LKES ^E HSS ^E SELV ^G -----II ^I FTAYLL
<i>M. incognita</i> NPR-11.1	-----
<i>M. incognita</i> NPR-11.2	MNSVLDINTYNSK-----NGNTSSIIILSEHSQQQE ^Q -KLEK ^C CHEMEAL ^L FSGL ^I NN ^F FR ^D DI ^V LKES ^E HSS ^E SEL ^L G-----NL ^L FTAYLL

Consensus

C LF IN YFRDD VL TEHS G W IT AYIL

<i>B. malayi</i> NPR-11	VILFGAFGNMLTIIAVLYNPQIR ^T TRNFFILNLALSDF ^F ICTI ^A APIT ^F YTVLY ^I FW ^P FG ^L AMCK ^I TG ^S LLG ^F GIFLSTF ^S IAAIALDR ^C VVI ^I FP ^T K ^R K
<i>W. bancrofti</i> NPR-11	VILFGAFGNMLTIFAVLYNPQIR ^T TRNFFILNLALSDF ^F ICTI ^A APIT ^F YTVLY ^I FW ^P FG ^L AMCK ^I TG ^S LLG ^F GIFLSTF ^S IAAIALDR ^C VVI ^I FP ^T K ^R K
<i>D. immitis</i> NPR-11	VILFGTFGNMLTIIAVLYNPQIR ^T TRNFFILNLALSDF ^F ICTI ^A APIT ^F YTVLY ^I FW ^P FG ^L TMCK ^I TG ^S LLG ^F GIFLSTF ^S IAAIALDR ^C VVI ^I FP ^T K ^R K
<i>O. volvulus</i> NPR-11	VILFGTFGNMLTIIAVAYNPQIR ^T TRNFFILNLALSDF ^F ICTI ^A APIT ^S YTVLY ^T FW ^P FG ^L TMCK ^I TG ^S LLG ^F GIFLSTF ^S IAAIALDR ⁻ VVI ^I FP ^T K ^R K
<i>O. ochengi</i> NPR-11	VILFGTFGNMLTIIAVLYNPQIR ^T TRNFFILNLALSDF ^F ICTI ^A APIT ^S YTVLY ^T FW ^P FG ^L TMCK ^I TG ^S LLG ^F GIFLSTF ^S IAAIALDR ⁻ VVI ^I FP ^T K ^R K
<i>L. loa</i> NPR-11	VILFGTFGNMLTIIAVLYNPQIR ^T TRNFFILNLALSDF ^F ICTI ^A TAPIT ^S YTVLY ^T FW ^P FG ^L AMCK ^I TG ^S LLG ^F GIFLSTF ^S IAAIALDR ^V VVI ^I FP ^T K ^R K
<i>A. suum</i> NPR-11	VIVFGALGNMLTIVLAVIR ^N PQMR ^T TRNFFI ^V NLALSDF ^F ICTI ^V TAPIT ^L YTVLY ^I FW ^P FG ^T ALCK ^I AGS ^L QGF ^N GIFLSTF ^S IAAIALDR ^V VVI ^I FP ^T K ^R K
<i>A. caninum</i> NPR-11	-----LYMFWPFGTALCKIAGSLQGFNIFLSTF ^S IAAIALDR ^V VVI ^I FP ^T K ^R E
<i>N. brasiliensis</i> NPR-11	VIIIFGACGNFLTMLVVALNPTMR ^T TRNFFI ^F NLALSDF ^F VCTI ^T APMT ^L YTVLY ^M FW ^P FG ^T ALCKIAGS ^L QGF ^N IFLSTF ^S IAAIALDR ^V VVI ^I FP ^T K ^R E
<i>H. contortus</i> NPR-11	VILFGACGNFLAMLVVV ^L NPTMR ^T ARNFFI ^F NLALSDF ^F VCTI ^V TAPMT ^L YTVLY ^M FW ^P FG ^T ALCKIAGS ^L QGF ^N IFLSTF ^S IAAIALDR ^V VVI ^I FP ^T K ^R E
<i>C. elegans</i> NPR-11	IILFGAIGNFLTIIIVVILN ^E AMR ^T TRNFFI ^L NLALSDF ^F VCTI ^V TAPMT ^L YTVLY ^M FW ^P FSRT ^L CKIAGS ^L QGF ^N IFLSTF ^S IAAIALDR ^V VVI ^I FP ^T K ^R E
<i>S. ratti</i> NPR-11	VILFGAFGNMLTIFI ^V L ^R NK ^S MRT ^V Q ^N FFI ^L NLALG ^D FM ^I CTI ^T APIT ^F FN ^L SE ^T FW ^K YGNALCK ^F VSS ^I GGFNIFLSTF ^S IAAIALDR ^F LV ^I FP ^T QQQ
<i>B. xylophilus</i> NPR-11	VISLGI ^F GNAL ^T IVAI ^L R ^N K ^Q M ^R N ^V R ^N FFI ^L NLALSDF ^F ICTI ^V TAPIT ^L YTVLY ^M FW ^P FG ^T ALCKIAGS ^L QGF ^N IFLSTF ^S IAAIALDR ^V VVI ^I FP ^T K ^R E
<i>G. pallida</i> NPR-11	VIVFGTVGNLTI ^L AVL ^R NK ^Q MRT ^V R ^N FFI ^L NLALSDF ^F VCTI ^V TAPIT ^L YTVLY ^M FW ^P FG ^T ALCKIAGS ^L QGF ^N IFLSTF ^S IAAIALDR ^V VVI ^I FP ^T K ^R Q
<i>M. hapla</i> NPR-11	VIAFGSFGNLTIMAVL ^R NK ^Q MRT ^V R ^N FFI ^L NLALSDF ^F VCTI ^V TAPIT ^L YTVLY ^M FW ^P FSRT ^L CKIAGS ^L QGF ^N IFLSTF ^S IAAIALDR ^V VVI ^I FP ^T K ^R Q
<i>M. incognita</i> NPR-11.1	-----RNFFILNLALSDF ^F VCTI ^V TAPIT ^L YTVLY ^M FW ^P FSRT ^L CKIAGS ^L QGF ^N IFLSTF ^S IAAIALDR ^V VVI ^I FP ^T K ^R Q
<i>M. incognita</i> NPR-11.2	VIAFGSIGNLTI ^M AVL ^R NK ^Q MRT ^V R ^N FFI ^L NLALSDF ^F VCTI ^V TAPIT ^L YTVLY ^M FW ^P FSRT ^L CKIAGS ^L QGF ^N IFLSTF ^S IAAIALDR ^V VVI ^I FP ^T K ^R Q

Consensus

VILFGAFGNMLTIIAVL NPQMR^TTRNFFI^LNLALSDF^FICTI^TAPIT^LYTVLY^MFW^PFG ALCKIAGS^LQGF^NIFLSTF^SIAAIALDR^VVVI^IFP^TK^R

B. malayi NPR-11 RQHNLA^{LL}FL^{LI}W^{VI}SI^{IT}LAL^{PL}LL^{IT}SDLN^{TV}FDD^{DK}CG^{IS}LK^{IC}HE^{KNE}IWN^{LMP}ISK^{RAY}TLAV^{LL}TQ^{YA}LPL^ISIV^{FAY}STIAM^{KM}QIR^{MNS}RRLA-
W. bancrofti NPR-11 RQHNLA^{LL}FL^{LI}W^{VI}SI^{IT}LAL^{PL}LL^{IT}SDLN^{TV}FDD^{DK}CG^{IS}LK^{IC}HE^{KNE}IWN^{LMP}ISK^{RAY}TLAV^{LL}TQ^{YA}LPL^ISIV^{FAY}STIAM^{KM}QIR^{MNS}RRLA-
D. immitis NPR-11 RQHNLA^{LL}FL^{LI}W^{VI}SI^{IT}LAL^{PL}LL^{IT}SDLN^{TV}YED^{DK}CG^YY^{LE}IC^{HE}KNE^{IWN}LMP^{ISK}RAY^{TL}GV^{LL}TQ^{YA}LPL^ISIV^{FAY}STIAM^{RM}QIR^{MNS}RRLA-
O. volvulus NPR-11 RQHNLA^{LL}FL^{LI}W^{VI}SI^{IT}LAL^{PL}LL^{IT}SDLN^{TV}FED^{DK}CG^{IS}LK^{IC}HE^{KNE}IW⁻⁻MP^{ISK}RAY^{TL}AV^{LL}TQ^{YA}LPL^ISIV^{FAY}STIAM^{RM}QIR⁻⁻⁻⁻
O. ochengi NPR-11 RQHNLA^{LL}FL^{LI}W^{VI}SI^{IT}LAL^{PL}LL^{IT}SDLN^{TV}FED^{DK}CG^{IS}LK^{IC}HE^{KNE}IWN⁻MP^{ISK}RAY^{TL}AV^{LL}TQ^{YA}LPL^ISIV^{FAY}STIAM^{RM}QIR^{M----}
L. loa NPR-11 RQHNLA^{LL}FL^{LI}W^{VI}SI^{IT}LAL^{PL}LL^{IT}SDLN^{TV}FDD^{DK}CG^{IS}LK^{IC}HE^{KNE}IWN^{LMP}ISK^{RAY}TLAV^{LL}TQ^{YA}LPL^ISIV^{FAY}STIAM^{KM}QIR^{MNS}RRLA-
A. suum NPR-11 RQHNLS^{LL}FF^{SL}IW^{LI}SI^{AL}AL^{PL}LL^{IAS}DLN^{TI}FED^{HNC}DIS^{LQ}IC^{HE}KNE^{IW}Q^{QMP}IG^{KE}AY^{TL}AV^{LV}TQ^{YA}LPL^ISIV^{FAY}TRIA^{HR}M^QQ^{QF}AIR^{MS}-
A. caninum NPR-11 RQ^QNLS^{LM}FF^VIW^VLS^LIL^{AV}PL^{LI}AS^{DL}N^{TI}YED^{PV}CE^{IS}L^RIC^{HE}QNDIW^QTMM^{ISK}Q^TY^{TL}SV^{LV}TQ^{YA}FP^{LF}SL^VFAY^{TR}IA^{HR}M^KLR^{FAN}R---
N. brasiliensis NPR-11 RQ^QKL^{SL}M^{FF}V^IW^VLS^LIL^{AV}PL^{LI}AS^{DL}N^{TI}FV^EP^{SC}G^{IS}L^RIC^{HE}QNDIW^QTMM^{ISK}Q^TY^{TL}SV^{LV}TQ^{YA}FP^{LF}SL^VFAY^{TR}IA^{HR}M^KLR^{FAN}R---
H. contortus NPR-11 RQ^QNLS^{LM}FF^VLI^WV^{SL}VL^{AV}PL^{LI}AS^{DL}N^{TI}YED^{SS}CD^{IS}L^RIC^{HE}Q^{NE}IW^Q-MM^{ISK}R^TY^{TL}SV^{LV}TQ^{YA}FP^{LF}SL^VFAY^{TR}IA^{HR}M^KLR^{FAN}R---
C. elegans NPR-11 RQ^QNLS^{FC}FF^IW^VLS^LIL^{AV}PL^{LI}AS^{DL}TP^VFV^EP^{SC}DL^{AL}Y^{IC}HE^QNE^IW^EK^{MI}ISK^{GT}Y^{TL}AV^{LV}TQ^{YA}FP^{LF}SL^VFAY^{SR}IA^{HR}M^KLR^{FAN}R---
S. ratti NPR-11 RQ^KFF^{SI}IL^FAL^IW^ILS^{LL}SI^{PI}IV^{VS}ST^{MF}Y^EVE^FCN^LTL^{YL}CN^EN^ELAW^{DK}MP^{SK}LS^{YT}IS^{LV}I^HY^{AF}PI^{VS}M^VFAY^{TK}IAS^{RM}HS^RFV^{HR}N--
B. xylophilus NPR-11 RQ^HNLS^{LL}FF^{SL}IW^{LI}SI^{LL}AL^{PL}FD^{AS}DL^{NI}FQ^{DK}NC^GIS^LT^{IC}HE^QNE^KW^QMA^{TK}EV^YTV^{GV}LV^{FV}Q^{YA}FP^{LT}SI^AFAY^{SR}IAR^{RM}GAR^FAARN--
G. pallida NPR-11 RQ^QRL^{SL}M^{FF}SM^IW^{LA}S^{ILL}AA^{PL}FL^{AA}DL^{RP}V^{FR}D^NRC^QIED^{LC}SE^QNER^WKEL^SSK^{ES}Y^{TL}GV^{IL}LQ^{YA}FP^{LA}IA^FAY^{SR}IAR^{RM}GAR^RARG^{GS}G
M. hapla NPR-11 RQ^QNLS^{IF}FS^LIW^{LA}S^{ILL}AA^{PL}FL^{AA}DI^{SP}I^FH^DV^{QC}GI^EL^KLC^{NE}Q^{NER}W^{RE}LL^SKEA^{YT}GG^VIL^{LQ}YL^{PL}AS^{IA}FAY^{SR}IAR^{RM}GAR^KSC^{RC}GS
M. incognita NPR-11.1 RQ^QNLS^{IF}FS^LIW^{LA}S^{ILL}AA^{PL}FL^{AA}DI^{SP}I^FH^DS^{QC}GI^EL^NLC^{NE}Q^{NER}W^KEL^LIS^{KEA}Y^{TV}GV^{IL}LQ^{YL}PL^{AS}IA^FA⁻S^RIAR^{RM}GT^{SK}S^FRCAS
M. incognita NPR-11.2 RQ^QNLS^{IF}FS^LIW^{LA}S^{ILL}AA^{PL}FL^{AA}DI^{TP}I^FH^DS^{QC}GI^EL^NLC^{NE}Q^{NER}W^KEL^MN^{KEA}Y^{TV}GV^{IL}LQ^{YL}PL^{AS}IA^FAY^{SR}IAR^{RM}GTR^SCRYAN

Consensus RQ NLSLLFF LIWVISILLALPLLIASDLNTIFED CGISLKICHEQNEIWN M ISK AYTLAVLLTQYALPL SIVFAYSRIA RM IR A R

B. malayi NPR-11 -----SSTF^{IT}NA^{IN}NE^{RR}KS^{VA}GR^{QR}RT
W. bancrofti NPR-11 -----SSTF^{TAN}VIN^{NE}RR^{KS}SV^{AG}RR^{QR}RT
D. immitis NPR-11 -----TSTF^{LAN}A^{IN}NE^{RR}RS^{VA}GR^{QR}RT
O. volvulus NPR-11 -----
O. ochengi NPR-11 -----
L. loa NPR-11 -----SSTF^{TAN}AN^NNE^{RR}KS^{VA}GR^{QR}RT
A. suum NPR-11 -----SCAN^{SL}AT^{MS}HR^{RR}-SV^{VE}RR^{QR}RT
A. caninum NPR-11 -----NISLP
N. brasiliensis NPR-11 -----NISF^PN^SLS^QNQ^{RR}RS^{SV}VE^{RR}QR^{RT}
H. contortus NPR-11 -----NIP^FSS^{SL}T
C. elegans NPR-11 -----NQNV^TT^NT^NTS^QRR^{RS}SV^{VE}RR^{QR}RT
S. ratti NPR-11 -----NIK^LIGEDANN-RR^{KH}VA^{ER}QR^{RT}
B. xylophilus NPR-11 -----RHSR-----SI^{AD}RR^{HR}RT
G. pallida NPR-11 GGGTAGNQPNTFRKSSGTGVGFQTLT^TNCFNAP^{EV}TKQ^SNGQ^TV^{LT}TLN^{STA}ASQ^{KAT}K^TS^{ISS}NGE-----VKNA^{AE}ALISQ^{RR}KS^{VA}DR^{HR}RT
M. hapla NPR-11 GGGVDS-----RKNSV^YLNT^PV^{FS}-NRSSL^{CR}QIAAGGATSP^{FS}ASDNGHQ^{NSK}----LVIF^TNDE^TNCN--LLQ^NVNP^{SAE}ILLN^QRR^{KS}IA^{VR}HR^{RT}
M. incognita NPR-11.1 GG-RDS-----RKNSV^YLNT^PV^{LS}NRSS^{FR}Q^{IA}SGGATSP^{FI}ASDNGHK^{HS}SNK^QPLV^{IST}NGEY^SQTNG^NLHN^{VNP}SAE^{ILL}KQ^{RR}KS^{IA}DR^{HR}RT
M. incognita NPR-11.2 GG-RDS-----RKNSV^YLNT^PV^{FG}SNRSS^{FR}Q^{IA}SGGATSP^{FI}ASDNGHK^{HS}SNK^QPLV^{IST}NGEY^SQTNG^NLQ^{NVNP}SAE^{ILL}KQ^{RR}KS^{IA}DR^{HR}RT

Consensus T RRKSV A R RRT

B. malayi NPR-11 HLLL^{IC}V^VI^VF^{AV}AW^LPL^NV^{FH}----V^LNT^FG^IVE⁻FS^VPL^{FA}IC^{HL}I^{AM}G^SACL^NP^{VS}Y^AFF^NQ^NFR^QQ^FIM^FY^EAA^{IR}KN^LQ^IFG^WIT^{AV}R^NM^R-D^GV
W. bancrofti NPR-11 HLLL^{IC}V^VI^VF^{AV}AW^LPL^NV^{FH}----V^LNT^FG^IVE⁻FS^VPL^{FA}IC^{HL}I^{AM}G^SACL^NP^{VS}Y^AFF^NQ^NFR^QQ^FIM^FY^EGAA^{IR}KI^LQ^IFG^WIT^PAR^NM^R-D^RV

D. immitis NPR-11 HLLLCVVTTF¹FAV²AWL³PLNVF⁴H---VLN⁵TF⁶G⁷IV⁸E-F⁹SV¹⁰PL¹¹FA¹²ICH¹³L¹⁴IAM¹⁵GSS¹⁶CL¹⁷NP¹⁸VS¹⁹YAFF²⁰N²¹Q²²N²³FR²⁴Q²⁵Q²⁶F²⁷VM²⁸F²⁹Y³⁰DA³¹AI³²RKI³³L³⁴QISDLVTPTRYKR-DRM
O. volvulus NPR-11 -----WL¹PLNVF²H---VLN³TF⁴G⁵IV⁶E-F⁷SV⁸PL⁹FA¹⁰ICH¹¹L¹²IAM¹³GSA¹⁴CL¹⁵NP¹⁶VS¹⁷YAFF¹⁸N¹⁹Q²⁰N²¹FR²²Q²³Q²⁴F²⁵VM²⁶F²⁷YD-----
O. ochengi NPR-11 -----WL¹PLNVF²H---VLN³TF⁴G⁵IV⁶E-F⁷SV⁸PL⁹FA¹⁰ICH¹¹L¹²IAM¹³GSA¹⁴CL¹⁵NP¹⁶VS¹⁷YAFF¹⁸N¹⁹Q²⁰N²¹FR²²Q²³Q²⁴F²⁵VM²⁶F²⁷YD-----
L. loa NPR-11 HLLLCVVTTF¹FAV²AWL³PLNVF⁴H---VLN⁵TF⁶G⁷IV⁸E-F⁹SV¹⁰PL¹¹FA¹²ICH¹³L¹⁴IAM¹⁵GSA¹⁶CL¹⁷NP¹⁸VS¹⁹YAFF²⁰N²¹Q²²N²³FR²⁴Q²⁵Q²⁶F²⁷IM²⁸F²⁹Y³⁰EAA³¹IRKI³²L³³QTFD³⁴V³⁵W³⁶TP³⁷AR³⁸NKH-DRV
A. suum NPR-11 HLLLCV¹V²IM³FA⁴V⁵AWL⁶PLNVF⁷H---VLN⁸TF⁹G¹⁰IV¹¹KG¹²F¹³SV¹⁴PL¹⁵FA¹⁶L¹⁷CH¹⁸V¹⁹IAM²⁰GSA²¹CL²²NP²³VS²⁴YAFF²⁵N²⁶HN²⁷FR²⁸Q²⁹Q³⁰F³¹V³²AM³³F³⁴EQA³⁵GL³⁶SR³⁷LGILLHLRKKCMLGGRR-----
A. caninum NPR-11 -----
N. brasiliensis NPR-11 HLLLCV¹V²V³FA⁴I⁵AWL⁶PLNVF⁷H---MV⁸N⁹TF¹⁰EW¹¹V¹²SL¹³F¹⁴SV¹⁵ST¹⁶FA¹⁷V¹⁸CH¹⁹V²⁰AAM²¹C²²SA²³CL²⁴NP²⁵LI²⁶YAFF²⁷N²⁸HN²⁹FR³⁰TE³¹FI³²AL³³FER³⁴L³⁵G³⁶FR³⁷K³⁸RDVV³⁹FS⁴⁰W⁴¹DE⁴²ER⁴³ER⁴⁴KK⁴⁵GM
H. contortus NPR-11 HLLLCV¹V²V³FA⁴I⁵AWL⁶PLNVF⁷H---NT⁸TF⁹EW¹⁰V¹¹SL¹²F¹³SV¹⁴ST¹⁵FA¹⁶ICH¹⁷V¹⁸AAM¹⁹C²⁰SA²¹CL²²NP²³LI²⁴YAFF²⁵N²⁶HN²⁷FR²⁸TE²⁹FI³⁰RL³¹FE³²K³³L³⁴GL³⁵R-----
C. elegans NPR-11 HLLLCV¹V²V³FA⁴V⁵AWL⁶PLNVF⁷H---I⁸F⁹NT¹⁰FE¹¹V¹²NS¹³F¹⁴SV¹⁵TF¹⁶SI¹⁷CH¹⁸L¹⁹AAM²⁰C²¹SA²²CL²³NP²⁴LI²⁵YAFF²⁶N²⁷HN²⁸FR²⁹IE³⁰FM³¹HL³²F³³DR³⁴V³⁵GL³⁶RS³⁷RVV³⁸IF³⁹GE⁴⁰Q⁴¹ES⁴²L⁴³KK⁴⁴SM⁴⁵RT
S. ratti NPR-11 N¹FL²LA³S⁴V⁵LL⁶FA⁷I⁸AWL⁹F¹⁰N¹¹I¹²F¹³H---M¹⁴LL¹⁵SL¹⁶K¹⁷V¹⁸I¹⁹IT²⁰V²¹SG²²TL²³F²⁴AL²⁵CH²⁶LM²⁷CM²⁸MM²⁹SA³⁰CL³¹NP³²V³³C³⁴YAFF³⁵N³⁶Q³⁷N³⁸FR³⁹N⁴⁰EL⁴¹FI⁴²L⁴³H⁴⁴K⁴⁵K⁴⁶LR⁴⁷KN⁴⁸S⁴⁹NING⁵⁰IN⁵¹RT⁵²EY⁵³SAT⁵⁴V⁵⁵K⁵⁶R
B. xylophilus NPR-11 H¹FL²M³V⁴TL⁵V⁶V⁷V⁸FA⁹SA¹⁰WL¹¹PL¹²N¹³I¹⁴F¹⁵H---L¹⁶V¹⁷N¹⁸-T¹⁹FN²⁰I²¹V²²QR²³F²⁴SV²⁵PT²⁶FA²⁷L²⁸CH²⁹V³⁰T³¹AL³²C³³SA³⁴CL³⁵NP³⁶LI³⁷YAFF³⁸N³⁹Q⁴⁰N⁴¹FR⁴²TE⁴³F⁴⁴V⁴⁵AM⁴⁶F⁴⁷ES⁴⁸L⁴⁹GL-----
G. pallida NPR-11 N¹LL²V³TL⁴V⁵V⁶V⁷FA⁸FA⁹WL¹⁰PL¹¹N¹²I¹³F¹⁴H---L¹⁵V¹⁶N¹⁷-T¹⁸F¹⁹SS²⁰SAS²¹F²²SV²³P²⁴V²⁵F²⁶AL²⁷CH²⁸L²⁹I³⁰TAM³¹C³²SA³³CL³⁴NP³⁵CC³⁶YAFF³⁷N³⁸Q³⁹N⁴⁰FR⁴¹Q⁴²E⁴³FL⁴⁴AI⁴⁵Y⁴⁶H⁴⁷K⁴⁸L⁴⁹GL⁵⁰I⁵¹W⁵²YRR⁵³F⁵⁴SL⁵⁵FG⁵⁶KS⁵⁷I⁵⁸GL⁵⁹NG⁶⁰DS
M. hapla NPR-11 N¹M²LL³V⁴TL⁵V⁶V⁷V⁸FA⁹CA¹⁰WL¹¹PL¹²N¹³I¹⁴F¹⁵HAY¹⁶TL¹⁷L¹⁸FN¹⁹KE²⁰SKTAS²¹F²²SV²³PT²⁴FA²⁵L²⁶CH²⁷L²⁸I²⁹TAM³⁰C³¹SA³²CL³³NP³⁴CC³⁵YAFF³⁶N³⁷Q³⁸N³⁹FR⁴⁰Q⁴¹E⁴²FL⁴³AM⁴⁴Y⁴⁵R⁴⁶K⁴⁷L⁴⁸GL⁴⁹M-----
M. incognita NPR-11.1 N¹M²LL³V⁴TL⁵V⁶V⁷V⁸FA⁹CA¹⁰WL¹¹PL¹²N¹³I¹⁴F¹⁵HAY¹⁶TL¹⁷L¹⁸FN¹⁹KE²⁰SKTAS²¹F²²SV²³PT²⁴FA²⁵L²⁶CH²⁷L²⁸I²⁹TAM³⁰C³¹SA³²CL³³NP³⁴CC³⁵YAFF³⁶N³⁷Q³⁸N³⁹FR⁴⁰Q⁴¹E⁴²FL⁴³AM⁴⁴Y⁴⁵R⁴⁶K⁴⁷L⁴⁸GL⁴⁹IT⁵⁰YRC⁵¹F⁵²AR⁵³FT⁵⁴K⁵⁵R⁵⁶L⁵⁷CP⁵⁸ST⁵⁹EI
M. incognita NPR-11.2 N¹M²LL³V⁴TL⁵V⁶V⁷V⁸FA⁹CA¹⁰WL¹¹PL¹²N¹³I¹⁴F¹⁵HAY¹⁶TL¹⁷L¹⁸FN¹⁹KL²⁰SKTAS²¹F²²SV²³PT²⁴FA²⁵L²⁶CH²⁷L²⁸I²⁹TAM³⁰C³¹SA³²CL³³NP³⁴CC³⁵YAFF³⁶N³⁷Q³⁸N³⁹FR⁴⁰Q⁴¹E⁴²FL⁴³AM⁴⁴Y⁴⁵R⁴⁶K⁴⁷L⁴⁸GL⁴⁹TT⁵⁰YRC⁵¹F⁵²V⁵³R⁵⁴FT⁵⁵K⁵⁶R⁵⁷L⁵⁸CP⁵⁹ST⁶⁰EI

Consensus HLLLV VVVVFAVAVLPLNVF.....VLN⁵TF IV FSVPLFAICHLIAM SA¹⁴CLNPV YAFFNQNFRQEFV MYE LGL L

B. malayi NPR-11 KYSRS¹AK²SV³IT⁴-----TS⁵A⁶IN⁷A⁸Q⁹L¹⁰V¹¹GR¹²GD¹³N¹⁴DE¹⁵K¹⁶SEE¹⁷EAK¹⁸ID¹⁹L²⁰NDH-----
W. bancrofti NPR-11 KYSRS¹AK²P³V⁴IT⁵TQ-----HT⁶S⁷A⁸IN⁹A¹⁰Q¹¹F¹²V¹³GR¹⁴GD¹⁵N¹⁶DE¹⁷K¹⁸SEE¹⁹EAK²⁰ID²¹L²²NDH-----
D. immitis NPR-11 KYN¹Q²SP³RNA⁴IM⁵Q-----HT⁶ST⁷FN⁸V⁹K¹⁰Y¹¹MG¹²K¹³G¹⁴D¹⁵K¹⁶DK¹⁷AE¹⁸I¹⁹HL²⁰NN-----
O. volvulus NPR-11 -----
O. ochengi NPR-11 -----
L. loa NPR-11 KYN¹RS²AN³AV⁴IT⁵TQ-----HA⁶ST⁷IN⁸AK⁹FM¹⁰G¹¹K¹²CD¹³NE¹⁴K¹⁵P¹⁶DE¹⁷EAK¹⁸ID¹⁹L²⁰NDH-----
A. suum NPR-11 KYA¹AT²SCA³V⁴ASS⁵KS⁶PR⁷ML⁸P⁹TT¹⁰V¹¹H¹²NE¹³E¹⁴F¹⁵N¹⁶EE¹⁷H¹⁸DA¹⁹AP²⁰KE²¹SE²²F²³IL²⁴R²⁵IN²⁶M²⁷V²⁸NTV-----
A. caninum NPR-11 -----
N. brasiliensis NPR-11 ERE¹V²K³SS⁴CPT⁵AV⁶HT⁷VRT⁸SVA⁹ER¹⁰LDES¹¹VAL¹²H¹³LDT¹⁴DE¹⁵QL-----
H. contortus NPR-11 -----
C. elegans NPR-11 EFR¹SR²GG³CK⁴TV⁵TTA⁶EP⁷AT⁸F⁹Q¹⁰R¹¹M¹²NES¹³MIL¹⁴SAME¹⁵Q¹⁶DE¹⁷QL-----
S. ratti NPR-11 STC-----
B. xylophilus NPR-11 -----
G. pallida NPR-11 SDK¹KT²K³WR⁴PNR-----
M. hapla NPR-11 -----
M. incognita NPR-11.1 NKE¹KS²V³D⁴AT⁵Q⁶S⁷NE⁸N⁹KE¹⁰L¹¹GT¹²SP¹³SE¹⁴NEAN¹⁵QH¹⁶L¹⁷Q¹⁸TI¹⁹Q²⁰GV²¹L²²KN²³S²⁴KE²⁵K²⁶SCE²⁷V²⁸LN²⁹V³⁰K³¹ME³²N³³Q³⁴T³⁵KN³⁶P³⁷LE³⁸LC³⁹ET⁴⁰LIE⁴¹K⁴²PP⁴³N⁴⁴LAK⁴⁵TI⁴⁶Q⁴⁷MD⁴⁸L
M. incognita NPR-11.2 SK-----

Consensus

10. NPR-12 homologues

B. malayi NPR-12 -----NNFLWQHRGGS-YVLLLYGLVCFGTLANLFVLI AFLRTSHIRNLRNYFIANLAMSDFLLCVVTA
W. bancrofti NPR-12 -----NNFLWQHRGGS-YVLLLYGLVCFGTLANLFVLI AFLRTSHIRNLRNYFIANLAMSDFLLCVVTA
O. volvulus NPR-12 -----LHKFQNSFLWQHRGEN-YVLLLYGLLCSFGTLANLFVLI AFLRTSHIRNLRNYFIANLAASDFLLCVVTA
O. ochengi NPR-12 -----LHKFQNSFLWQHRGEN-YVLLLYGLLCSFGTLANLFVLI AFLRTSHIRNLRNYFIANLAVSDFLLCVVTA
L. loa NPR-12 -----MPALIFAESGSRSNWSDINCDEFDETYNQNSFLWQHRGES-YVLLLYGLVCFGTLANLFVLI AFLRTSHIRNLRNYFIANLAVSDFLLCVVTA
A. suum NPR-12 -----INCWVWFDETYIQNNFYWRHRGAC-YMLLLYGLVCFGTALANLLVLAFLRTPHLRNLNRNYFIANLAVSDLLMCTIVTA
N. brasiliensis NPR-12 -----PNASGEVWVVECDWFDERSMQNNFYVWLHLKSSIVFLYGLVCFGTALANLVVLFVAFIRTSNLRNLRNSFIVNLAASDFLLCVVTA
H. contortus NPR-12 -----PNASGEVWVVECDWFDQIRAMQNNFYVWLHLKSSIVFLYGLVCFGTALANLIVLFAFIRTSNLRNLRNSFIVNLAASDFLLCVVTA
C. elegans NPR-12 -----MQPPNSTGQWTEIHCDFWAEHQNYQN-SLYKINFDSPIVVPYGLVCSFGALANFIVLLAFVIRTANLRNLRNSFIVNLAASDFLLCVVTA
S. ratti NPR-12 -----NTMMWETRGIK-FLPYLYTVTCLIGFLANSILIVFLTKKLRNLRNYFIINLAISDLTICTVSA
B. xylophilus NPR-12 MNTMDLTPGPAAITVGSRNWSFFSCDALDEVMGIONGFYWRNKGAG-TIIMLYAIVCSFGALANLLVIVSFLKTPHLHNLNRNYFIANLAVSDLLMCTIVTA
G. pallida NPR-12 -----LQNHFLWRQNSPV-LLLSLYAIVCSFGTINLFLVLLSFARVAQLRNLNRNYFIANLAVSDLLICTVTA
M. hapla NPR-12 -----LQFNEQSNWTEMDCGWLDEIREIQNHFYWRHTNPA-LLLCLYAAVCFGTALANFLVLLSFARVAQLRNLNRNYFIANLAVSDLLMCTIVTA
M. incognita NPR-12 -----QFNEQHLNGTEMDCGWLDEIREIQNHFYWRHTNPA-LLLCLYAAVCFGTALANFFVLLSFARVAQLRNLNRNYFIANLAVSDLLMCTIVTA

Consensus I C DEI IQN FYW HRG G YVLLLYGLVCSFGALANLFVLI AFLRTSHLRNLRNYFIANLAVSDLLLCVVTA

B. malayi NPR-12 PVTLYLIRNLFWPFGLACQTLASVQAVNMFVSCMTLVLIAMDRVLLTFCPIKWQVLAAPVVMCYCTVWLASIVIAAPYFFAVNAEDV-MLEPWNQPY
W. bancrofti NPR-12 PVTLYLIRNLFWPFGLACQTLASVQAVNMFVSCMTLVLIAMDRVLLTFCPIKWQVLAAPVVMCYCTVWLASIVIAAPYFFAVNAEDV-MLEPWNQPY
O. volvulus NPR-12 PVTLYLIRNLFWPFGLACQTLASVQAVNMFVSCMTLVLIAMDRVLLTFCPIKWQVLAAPVVMCYCTVWLASIVIAAPYFFAVNAEDV-MLEPWNQPY
O. ochengi NPR-12 PVTLYLIRNLFWPFGLACQTLASVQAVNMFVSCMTLVLIAMDRVLLTFCPIKWQVLAAPVVMCYCTVWLASIVIAAPYFFAVNAEDV-MLEPWNQPY
L. loa NPR-12 PVTLYLIRNLFWPFGLACQTLASVQAVNMFVSCMTLVLIAMDRVLLTFCPIKWQVLAAPVVMCYCTVWLASIVIAAPYFFAVNAEDV-MLEPWNQPY
A. suum NPR-12 PVTLYLIRNLFWPFGLACQTLASVQAVNMFVSCMTLVLIAMDRVLLTFCPIKWQVLAAPVVMCYCTVWLASIVIAAPYFFAVNAEDV-MLEPWNQPY
N. brasiliensis NPR-12 PVTLYLIRNLFWPFGLACQTLASVQAVNMFVSCMTLVLIAMDRVLLTFCPIKWQVLAAPVVMCYCTVWLASIVIAAPYFFAVNAEDV-MLEPWNQPY
H. contortus NPR-12 PVTLYLIRNLFWPFGLACQTLASVQAVNMFVSCMTLVLIAMDRVLLTFCPIKWQVLAAPVVMCYCTVWLASIVIAAPYFFAVNAEDV-MLEPWNQPY
C. elegans NPR-12 PVTLYLIRNLFWPFGLACQTLASVQAVNMFVSCMTLVLIAMDRVLLTFCPIKWQVLAAPVVMCYCTVWLASIVIAAPYFFAVNAEDV-MLEPWNQPY
S. ratti NPR-12 PVTLYLIRNLFWPFGLACQTLASVQAVNMFVSCMTLVLIAMDRVLLTFCPIKWQVLAAPVVMCYCTVWLASIVIAAPYFFAVNAEDV-MLEPWNQPY
B. xylophilus NPR-12 PVTLYLIRNLFWPFGLACQTLASVQAVNMFVSCMTLVLIAMDRVLLTFCPIKWQVLAAPVVMCYCTVWLASIVIAAPYFFAVNAEDV-MLEPWNQPY
G. pallida NPR-12 PVTLYLIRNLFWPFGLACQTLASVQAVNMFVSCMTLVLIAMDRVLLTFCPIKWQVLAAPVVMCYCTVWLASIVIAAPYFFAVNAEDV-MLEPWNQPY
M. hapla NPR-12 PVTLYLIRNLFWPFGLACQTLASVQAVNMFVSCMTLVLIAMDRVLLTFCPIKWQVLAAPVVMCYCTVWLASIVIAAPYFFAVNAEDV-MLEPWNQPY
M. incognita NPR-12 PVTLYLIRNLFWPFGLACQTLASVQAVNMFVSCMTLVLIAMDRVLLTFCPIKWQVLAAPVVMCYCTVWLASIVIAAPYFFAVNAEDV-MLEPWNQPY

Consensus PVTLYLIRNLFWPFGLACQTLASVQAVNMFVSCMTLVLIAMDRVLLTFCPIKWQVLAAPVVMCYCTVWLASIVIAAPYFFAVNAEDV-MLEPWNQPY

B. malayi NPR-12 IDVTL-HICGRKRPQTCIE--KAWHRLPFSRRTYTLVLAIQYLLPLTALAFSFSQIGSAIYKRVKASTTIGQKRRQVMQQRNRKALLLLSLLVLIYATA
W. bancrofti NPR-12 IDVTL-HICGRKRPQTCIE--KAWHRLPFSRRTYTLVLAIQYLLPLTALAFSFSQIGSAIYKRVKASTTIGQKRRQVMQQRNRKALLLLSLLVLIYATA
O. volvulus NPR-12 IDL---YICGRKRPQTCIE--KAWHRLPFSRRTYTLVLAIQYLLPLTALAFSFSQIGSAIYKRVKASTTIGQKRRQVMQQRNRKALLLLSLLVLIYATA
O. ochengi NPR-12 IDL---YICGRKRPQTCIE--KAWHRLPFSRRTYTLVLAIQYLLPLTALAFSFSQIGSAIYKRVKASTTIGQKRRQVMQQRNRKALLLLSLLVLIYATA
L. loa NPR-12 TDVMI-HICGRKRPQTCIE--KAWHRLPFSRRTYTLVLAIQYLLPLTALAFSFSQIGSAIYKRVKASTTIGQKRRQVMQQRNRKALLLLSLLVLIYATA

A. suum NPR-12 **I**GTMV-RYCG**H**RPQ**I**C**L**E--**K**THRLPFSRRTYTLTVLAIQYLLPLAALAFQYSQIGSTIRRRVKASTTVDQRRH**M**QRNRKALLLLLVLYAIA
N. brasiliensis NPR-12 TPAML-KICDRSYPE**I**C**M**EMQDTWERAYISKTFFTVTVLAIQYLLPLFALAYAYMQIGSTIRRRSKVSR**T**INQARRMS**M**QSRNRKALLLLMILVLYAIC
H. contortus NPR-12 TPKML-SICGRSYPE**I**C**M**EIQDTWERAYISKTFFTIIVLAIQYLLPLFALAYAYVQIGSTIRRRSKVSR**T**INQARRMS**M**QSRNRKALLLLMILVLYAIC
C. elegans NPR-12 TPKML-TYCN**R**QVPE**I**CAEMQEAWDNAIVSKTYTTFVVLGIQYLLPLAALAYAYFQIGSTIQRRSKVSR**T**VD**T**TRRMQ**M**QRNRKALLLLFLVLYAYC
S. ratti NPR-12 TNLS**I**ELCPNALPP**N**VCGE--**D**RWFFY**M**KQIYTLTVLAIQYLLPLIILLYSYTQIGFVIK**H**RASIPMTMDANRRHERQK**L**TR**S**ILLLTALVLYALI
B. xylophilus NPR-12 **I**DEM**V**GLFEP**L**PK**M**CLER--**T**WHRLPVSRRTYTLTVLAIQYLLPLVSLGFAYSQIGFTIRRRVKYNTTVDQ**H**RK**Q**IL**A**QRNRKALLLLLVLYYIC
G. pallida NPR-12 **V**DHLL-SICDR**S**RPQ**I**C**M**ENPDT**N**RLPFSRRNYTLFVLGIQYLLPLSALAIAYSQIGSTIRRRVK**M**STTVDGDR**K**Q**S**WAKRNRKALLLLSCLVLYAIA
M. hapla NPR-12 **V**ELL**L**-P**I**CD**R**EQ**P**Q**I**C**M**ED**V**K**R**WDRLPFLEER---**I**LFK-RYLLPLSALAVAYSQIGSTIRRR**G**KASTT**V**HGER**K**Q**I**QRNRKAMFLLGLVLYAIA
M. incognita NPR-12 **V**ELL**L**-P**I**CD**R**EQ**P**Q**I**C**M**ED**V**K**R**WDRLPFSRRTYTLTVLAIQYLLPLSALAIAYSQIGSTIRRR**G**KASTT**V**HGER**K**Q**I**QRNRKAMFLLGLVLYAIA

Consensus IDLML IC R RPQICME K WHRLPFSRRTYTLTVLAIQYLLPLTALAFAYSQIGSTIRKRVK STTVDQ RRQVM QRNRKALLLLLLLVLYAIA

B. malayi NPR-12 **W**FP**M**NAYNVLNVLE**V**IE**F**SQ**Y**RYL**F**CHLVG**M**T**S**ACIN**P**ILYALIN**D**SFR**A**F**I**S**I**L**R**PVIRPCARYTT**V**STNHQ**S**TFT**F**SFNERELVNHNKAQ**I**S**I**-----
W. bancrofti NPR-12 **W**LP**M**NAYNVL**S**VLE**V**IE**F**SQ**Y**RYL**F**CHLVG**M**T**S**ACIN**P**ILYALIN**D**SFR**A**F**I**S**I**LV**R**PVIR**S**CTRYTT**V**ST**N**Q**S**TFT**F**SFNEREPVKHQEAQ**I**S**I**-----
O. volvulus NPR-12 **W**FP**M**NAYNVLNVLE**V**IE**F**SQ**Y**RY**I**F**C**H**L**TG**M**T**S**ACIN**P**ILYALIN**D**SFR**T**A**F**I**S**IL-----
O. ochengi NPR-12 **W**FP**M**NAYNVLNVLE**V**IE**F**SQ**Y**RY**I**F**C**H**L**TG**M**T**S**ACIN**P**ILYALIN**D**SFR**T**A**F**I**S**IL-----
L. loa NPR-12 **W**FP**M**NAYNVLNVLE**V**IE**F**SQ**Y**RYL**F**CHLVG**M**T**S**ACIN**P**ILYALIN**D**SFR**A**F**I**S**I**LV**R**PVIR**P**CTTY**S**S**V**PINQNTY**T**FSFNEHQ**L**FKHQ**E**VLAK**V**SC**I**K
A. suum NPR-12 **W**FP**M**NAYNVLNVLD**V**IE**F**SQ**Y**--**I**F**C**H**L**VG**M**T**S**AC**N**P**I**M**Y**GLIN**D**SFR**S**A**F**V**S**IL**R**PF**L**RP**C**T**K**Y**T**T**V**A**V**P**P**S**H**T**Y**T**F**S-----
N. brasiliensis NPR-12 **W**AP**M**NI**N**VLS**G**F**E**V**I**S**Y**SQ**Y**RYL**F**CHLVG**I**S**S**AC**V**N**P**I**T**Y**A**LV**N**ES**F**R**N**AL**H**H**M**FL**S**FR**P**C**V**T**S**G**D**S**A**S**S**---**Y**IT**N**SK**P**AK**A**T**N**REG**Y**STR**F**EL**P**T
H. contortus NPR-12 **W**AP**M**NI**N**VLS**G**F**E**V**I**S**Y**SQ**Y**--**L**F**C**H**L**VG**I**S**S**AC**V**N**P**I**T**Y**A**LV**N**ES**F**R**N**AL**H**H**M**FL**S**FR**P**C**V**T**S**G**D**S**A**S**S**Y**I**T**G**S**K**A**A**K**V**A**V**-----
C. elegans NPR-12 **W**AP**M**NI**Y**H**V**L**N**GL**E**I**N**Y**S**Q**N**MY**L**F**C**H**L**VG**I**S**S**T**C**V**N**P**I**V**A**LV**N**ES**F**R**N**AL**Q**S**M**L**Q**FR**P**C**V**T**T**T**G**A**A**T**N**V**Y**A**S**A**T**S**K**A**E**N**V**T**L**M**R**D**P**F**S**T**T**P**R**P**N**
S. ratti NPR-12 **W**FP**M**N**L**Y**H**I**L**T**V**L**G**L**I**K**Y**SQ**Y**--**I**T**L**H**F**I**G**V**T**S**V**I**N**P**L**L**Y**G**I**N**D**Q**F**K**N**A-----
B. xylophilus NPR-12 **W**LP**M**NAYNVLNV**F**E**V**IE**F**SQ**Y**--**L**Y**C**H**L**I**G**M**T**S**A**S**I**N**P**V**M**Y**G**L**I**N**D**SFR**N**A**F**N**M**L**R**P**F**F**G**P**C**-----
G. pallida NPR-12 **W**AP**M**NAYNVLH**V**F**E**A**N**F**S**Q**Y**Q**Y**L**F**CH**L**I**G**M**T**S**A**C**L**N**P**L**L**Y**A**L**I**N**D**SFR**S**A**F**I**Q**L**I**-----
M. hapla NPR-12 **W**AP**M**NI**Y**N**V**L**H**V**L**E**L**I**A**F**S**Q**Y**N**Y**L**F**CH**L**I**G**M**V**S**A**C**L**N**P**L**L**Y**A**L**I**N**S**F**R**A**F**I**Q**L**I**-----
M. incognita NPR-12 **W**AP**M**NI**Y**N**V**L**H**V**L**E**F**I**A**F**S**Q**Y**N**Y**L**F**CH**L**I**G**M**V**S**A**S**I**N**P**L**L**Y**A**L**I**N-----

Consensus W PM**N**A**Y**N**V**L**N**V**L**E**V**I**E**F**S**Q**Y** YL**F**CH**L**V**G**M**T**S**A**CIN**P**ILYALIN**D**SFR AFISIL

B. malayi NPR-12 -----
W. bancrofti NPR-12 -----
O. volvulus NPR-12 -----
O. ochengi NPR-12 -----
L. loa NPR-12 QYESLGRHGQSLNQISYR
A. suum NPR-12 -----
N. brasiliensis NPR-12 KNEEIE**T**L-----
H. contortus NPR-12 -----
C. elegans NPR-12 ERPDSV-----
S. ratti NPR-12 -----
B. xylophilus NPR-12 -----
G. pallida NPR-12 -----
M. hapla NPR-12 -----

M. incognita NPR-12

Consensus

11. NPR-13 homologues

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B. malayi NPR-13 -----LLCITALPITPVLAFAVKRWLFGSL
W. bancrofti NPR-13 -----VFYSALYATIFVVGVLIGNGLLIGSLVKRKRISVNPINIFLINLAISDQLLCITALPITPVLAFAVKRWLFGSL
D. immitis NPR-13 -----KHYNIYFQLFYSALYATIFVIGLIGNGLLIGSLVKRKRISVNPINIFLINLAISD-LLCITALPITPVLAFAVKRWLFGSL
O. volvulus NPR-13 -----CVDVNDIMSAFGDWTLRLDVQLFYSALYATIFVAGLIGNGLLIGNLVKRRKRISVNPINIFLINLAISDLLLLCITALPITPVLAFAVKRWLFGALL
O. ochengi NPR-13 -----FQLFYSALYATIFVAGLIGNGLLIGNLVKRRKRISVNPINIFLINLAISD-LLCITALPITPVLAFAVKRWLFGALL
L. loa NPR-13 -----NYPSFFQLFYSALYATIFVVGVLIGNGLLIGSLAKRKRISVNPINIFLINLAISD-LVSVTALPITPVLAFAVKRWLFGSL
A. suum NPR-13 -----QLIYSSLYAIFLIGLIGNGLLISSMVRKRHLISVNPINIFLINLAISDLLLLCITALPITPVLAFAVKRWLFGSL
A. caninum NPR-13 -----
N. brasiliensis NPR-13 -----CVDVNYILQMYGDWTSLEIRVTYSVVYAFIFVVGVLIGNGLLIGSLVLRKRISVANVFLNLAISDLLLLCITSVPIITPVLAFAVKRWLFGSL
H. contortus NPR-13 -----FQVVYSMVYALIFVVGVLIGNGLLIGSLVLRKRISVANVFLNLAISDLLLLCITAVPIITPVLAFAVKRWLFGSL
C. elegans NPR-13 MGDAESHHCIDVNAIQFNDWTVLFEVRLGYSVLYFLILITGLVGNGLLITISLMRKKLSVANIFLINLAISDLLLLCITAVPIITPVLAFAVKRWLFGIIM
S. ratti NPR-13 -----IFLKIISYIYIYAILFLLGLLIGNGLLIGSMVIRKRISVANIFLINLAISDILLCFITLAIITPLVSHKKVWLLGAFI
B. xylophilus NPR-13 -----IRRQMTVANVFLINLAISDLLLLCITALPITPVLAFAVKRWLFGDITM
G. pallida NPR-13 -----KQCVDLNTFMNSFGDWTLRTEVQYSFYALIFLVLIGNGLLIR--TIRRRMVSANVFLNLAISDLLLLCITALPITPVLAFAVKRWLFGSVL
M. hapla NPR-13 ---EIENCIELNSVLDQFGDWTLRWEVK-FFYSLFYAAIFVIGLIGNGLVFG--TIRRRMTVANVFLNLAISDLLLLCITALPITPVLAFAVKRWLFGAL
M. incognita NPR-13 ---EIENCIELNSVLDQFGDWTLRLDVKVFYSLFYAAIFVIGLIGNGLVFG--TIRRRMTVANVFLNLAISDLLLLCITALPITPVLAFAVKRWLFGAL

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Consensus L YS LYA IFVVGVLIGNGLLIGSLVIRKRISVANIFLINLAISDLLLLCITALPITPVLAFAVKRWLFGSL

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B. malayi NPR-13 CKLVPLCQGISVLISSYCLCFIADVDRYSIVMFTREPWTYHAYSLMAISWLSATVSSPLFVTQRLQPLALENTTLCGY---FCGEYNW PAD-NRIKLF
W. bancrofti NPR-13 CKLVPLCQGISVLISSYCLCFIADVDRYSIVMFTREPWTYHAYSLMAISWLSATVSSPLFVTQRLQPLALENTTLCGY---FCGEYNW PAD-NRIKLF
D. immitis NPR-13 CKLVPLCQGISVLISSYCLCFIADVDRYSIVMFTREPWTYHAYSLMAISWLSATVSSPLFVTQRLQPLALENTTLCGY---FCGEYNW PED-NRVKLF
O. volvulus NPR-13 CKLVPLCQKISVLISSYCLCFIADVDRYSIVMFTREPWTYHAYLLMAISWLSATVSSPLFVTQQLQPLALENTTLCGQ---FCGEYNW PED-NRIKLF
O. ochengi NPR-13 CKLVPLCQKISVLISSYCLCFIADVDRYSIVMFTREPWTYHAYLLMAISWLSATVSSPLFVTQQLQPLALENTTLCG---FCGEYNW PED-NRIKLF
L. loa NPR-13 CKLVPLCQGISVLISSYCLCFIADVDRYSIVMFTREPWTYHAYSLMAISWLSATVSSPLFVTQQLQPLALENTTLCGY---FCGEYNW PED-NRIKLF
A. suum NPR-13 CKLVPLCQGISVLISSYCLCFIADVDRYNIIVTPMKEPWTVRHARILVAISWLASVTVSSPLFVTQRLQPLALENTTLCGH---FCGEYDWP GD-NRVKLL
A. caninum NPR-13 -----QWIIIMCTWLVAMFASSPLYFSQSLKTLTSMANITLCEVQCFCGEFNWDQE-DHTKLV
N. brasiliensis NPR-13 CKLVPSQAISVLISSWCLCYIALDRYSIVTPLKEPWKLLHAQRVLIATWLVAFASSPLYFSQSLKTLTSMANITLCE---EFCGEYNW AQE-DHTKLV
H. contortus NRP-13 CKLVPPCQGFVLISSWCLCYIALDRYSIVTPLKEPWKLLHAQ-VLIATWLVAFIFTSPLYFSQSLKTLTSMANITLCE---FCGEFNW SQE-DHTKLV
C. elegans NPR-13 CKLVPTCQAFVLISSWCLCYIALDRYSIVTPLREPWSDRHARWLMFTWVAFVFLASPLYSQNLKTMVLENVTLCE---DFCGEFNW QSD-EISKIT
S. ratti NPR-13 CKLISPQQSTCVLVTSYSLCFIALDRYSIVTPLKEPYSIFQAQIFMFMWLSIIISIPSFVTISGLKVISSDAATLCE---FCGELYW PS--PQVQTG
B. xylophilus NPR-13 CKLVPPCQGISVLISSYCLCFIADVDRYSIVTPLKVPWITROAQCFMVLVWTAAVVLSLPLFVAQQLKHLAFANITLCEQ---FCGEYNW PTD-TRVKIT
G. pallida NPR-13 CKLVPLCQGISVLISSYCLCFIADVDRYSIVTPLKMPWIGIQAALMILCWVCCIAIASPLFMAQRLOLIEFNMTFCGL---FCGEYNW PEGHMQLKLA
M. hapla NPR-13 CKLVPLCQGISVLISSYCLCFIADVDRYSIVTPLKVPWNIQHAQWLMTLCTWFTCLIISSPLFVQGLQQLVYKNTFCGE---FCTELNWP TD-FRIKLF
M. incognita NPR-13 CKLVPLCQGISVLISSYCLCFIADVDRYSIVTPLKVPWNIQHAQWLMTLCTWFTCLIISSPLFVQGLQQLVYKNTFCGE---FCTELNWP TD-FRIKLF

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Consensus CKLVPLCQGISVLISSYCLCFIADVDRYSIVTPLKEPWT HAQ_LM ISWL SI VSSPLFVTQ_LQ LALENITLCG FCGEYNW P D RIKLF7

B. malayi NPR-13 YGSMELICQYLIPVITMTFCYWKILQKVRADWIVAQHS--MLTAAQQACTAVRKRVRMYVLILMVVVFMAWLPHTIVNIFRDFGI-----EAFLD

W. bancrofti NPR-13 YGSM^LLV^CQY^LIPV^TIM^TFCY^WKI^LQK^VRA^DW^IVAQHS--MLTAAQQAQTAVR^KRRV^MYV^LIL^MVV^FMASW^L-----T-----EAF^LD
D. immitis NPR-13 YGSM^LLV^CQY^LIPAT^IIM^TFCY^WKI^LQK^VRA^DW^IVAQHS--MLTVAQQAQTAVR^KRRV^MYV^LIL^MVV^FMASW^LPLT^IVNI^LFRD^FG----I-----EAF^LD
O. volvulus NPR-13 YGSM^LLV^CQY^LIPAI^IIM^TFCY^WKI^LQK^VQAD^WI^VAQHS--MLTAAQQAQTAVR^KRRV^MYV^LIL^MVV^FMASW^LPLT^IVNI^LFRD^FGIFAHVIV--AEAF^LD
O. ochengi NPR-13 YGSM^LLV^CQY^LIPAI^IIM^TFCY^WKI^LQK^VQAD^WI^VAQHS--MLTAAQQAQTAVR^KRRV^MYV^LIL^MVV^FMASW^LPLT^IVNI^LFRD^FGIFAHVIV--AEAF^LD
L. loa NPR-13 YGSM^LLV^CQY^LIPVT^IIM^TFCY^WNI^LQK^VRA^DW^IVAQHS--L^TAAQQAQTAVR^KRRV^MYV^LIL^MVV^FMASW^LPLT^IVNI^LFRD^FG-----IEAF^LD
A. suum NPR-13 YGTMLLI^CQY^LIPVS^IIM^TFCY^WKI^LQK^VRT^DW^IVTEGS--MLTQAQQAQTS^VR^KRRV^MYV^LIL^MVV^FMASW^FPLT^IVNI^LLRD^FG-----IGT^FLD
A. caninum NPR-13 Y-AFLLV^VQFV^IPAI^IMS^FFCY^WKI^LQK^VRA^DW^IVEEGS--MLTAAQQAQTAVR^KRRV^MYV^LIL^MVV^FMTSW^LPLSAV^NLK^DLEIP-----IGT^FLD
N. brasiliensis NPR-13 YGILLV^VQFMI^{PAI}IMS^FFCY^WKI^LQK^VRA^DW^IVEEGS--MLTAAQQAQTAVR^KRRV^MYV^LIL^MVV^FMTSW^FPLSAV^NLK^DLEIPLV-----L
H. contortus NRP-13 YGISLLAV^QFMI^{PAV}IMS^FFCY^WKI^LQK^VRT^DW^IVEEGS--MLTAAQQAQTAVR^KRRV^MYV^LIL^MVV^FMTSW^LPLSAV^NLK^DLEIP---L---VCC^LL
C. elegans NPR-13 YTTISLLI^QLIPAI^IMS^FFCY^WLM^ILQK^VQT^DW^IVDEGS--MLTAAQQAQTAVR^KRRV^MYV^LIL^MVIV^FMACW^FPLSAV^NLFRD^LGMRFEF^CQTVYK^VLM
S. ratti NPR-13 YGVILV^FQFV^IPSV^MGF^CY^WH^ILQK^VRE^DW^IVNKG^S--MLTQAQQAQTAVR^KRRV^MYV^LIL^MVV^FVLG^SWAP^LTLC^NMARD^FG-----VQL
B. xylophilus NPR-13 YGSALLI^LTYL^IPVS^IMA^FFCY^WKI^LQK^VRQ^DW^IVNTGS--MLTEAQAQHTS^VR^KRRV^MYV^LIL^MVAV^FMGSW^MPLT^IVNI^LLRD^IG-----VSA^LE
G. pallida NPR-13 YGISLLV^IQFLV^{PTA}IM^TY^CY^WKI^LQK^VRQ^DW^IV^PANS^SSTI^VVEQAQATV^RK^RRRV^MYV^LIL^MVLI^FMGSW^MPLT^IVNI^LLRD^IMD-----ILRDA
M. hapla NPR-13 YGISLISI^QFLI^PTL^IMT^YCY^WKI^LQK^VRQ^DW^IVPTNNS-IMSLEQAQATA^RK^RRRV^MYV^LIL^MVLI^FMGSW^MPLT^IVNI^LLRD^IG-----ISFLE
M. incognita NPR-13 YGISLISI^QFLI^PTL^IMT^YCY^WKI^LQK^VRQ^DW^IVSTNNS-IMSLEQAQATA^RK^RRRV^MYV^LIL^MVLI^FMGSW^MPLT^IVNI^LLRD^IG-----ISFLE

Consensus YGSM^LLV^IQY^LIPAI^IIM^TFCY^WKI^LQK^VRA^DW^IV S MLTAAQQAQTAVR^KRRV^MYV^LIL^MVV^FMASW^LPLT^IVNI^LLRD^LG AFLD

B. malayi NPR-13 IQMYF^KLLNVHAIAMTSIV^WNPLLYF^WMSKR^HRKAF^KEDMIGAGN^YYR--NN^DVRLTKR^FVV^IK--PQP^GNLYN^QN-----
W. bancrofti NPR-13 IQMYF^KLLNVHAIAMTSIV^WNPLLYF^WMSK-----NFR^RGTLD^PTC
D. immitis NPR-13 IQMYF^KLLNVHAIAMTSIV^WNPLLYF^WMSKR^HRKAF^KEDMIGTGN^YYR--NNE^LRLV^KR^VCM^SR--SPR^PGNLYD^QNDT-----N^YRRS^TLD^PTC
O. volvulus NPR-13 IQMYF^KLLNVHAIAMTSIV^WNPLLYF^WMSKR^HRKTF^KEDMIGAGN⁻YR--NNE^LK^LM^KR^LCE^PK--SPQ^PGNHYD^QSDRH-----NFR^RGTLD^PTC
O. ochengi NPR-13 IQMYF^KLLNVHAIAMTSIV^WNPLLYF^WMSKR^HRKTF^KEDMIGAGN⁻YR--NNE^LK^LM^KR^LCE^PR--SPQ^PGNHYD^QSDRH-----NFR^RGTLD^PTC
L. loa NPR-13 IQMYF^KLLNVHAIAMTSIV^WNPLLYF^WMSKR^HRKAF^KEDMIGTGN^YYR--NNE^MRLM^KR^FFI^SK--SPQ^PNNLVY^KQ^NHR-----NFR^RGTLD^PTC
A. suum NPR-13 IQMYF^KLLNVHAIAMTSIV^WNPLLYF^WMSKR^HRRLK^YDM^FSLTN⁻PR--H^IQL^GV^LGR^FT^PSP^SFN^VIY^RRT^VER^HMRN-----NFR^RGTLD^PTC
A. caninum NPR-13 -----LQ^RHRRAL^KDDMT^WLTN^VRR--HTN^VGV^LSR^FAP^SPS^VSLV^YRR^TLER^HISV^G-----NFR^RGTLD^PTC
N. brasiliensis NPR-13 EQMYF^KLMNAHAIAMTSIV^WNPLLYF^WMSKR^HRRLK^DDM^TW^LTN^ARR--HTN^VGV^LSR^FTP^SPS^VSLV^YRR^TLER^HIG^VN-----NFR^RGTLD^PTC
H. contortus NRP-13 EQMYF^KLLNVHAIAMTSIV^WNPLLYF^WMSKR^HRRLK^DDM^TW^LTN^VRR--HTN^VGV^LSR^FAP^SPS^VSLI^YRR^TLER^HIG^VT-----NFR^RGTLD^PTC
C. elegans NPR-13 DQMYF^KLLNVHAIAMTSIV^WNPLLYF^WMSKR^HRRLK^DDM^TW^LTN^ARR--HTN^VGV^LSR^FTP^SPS^VSV^VY^RRT^LER^HIG^VN-----HFR^RGTLD^PTC
S. ratti NPR-13 TERYF^ITL^CANI^IAMTSI^ITN^PMLY^FW^LSKR^HRRLK^DDM^FW^LTN^VRRN--QQ^NI^GL^DQ^FEPS---SLL^YK^KS^YPL^TISS^F---HQ^NNR^RGTLD^PTC
B. xylophilus NPR-13 IQMYF^KLLNAHAVAM^SSIV^SNPLLYF^WMSKR^HRRLK^DDM^FW^LTN^VRR--Q^HQ^MGL^LE^KF^AP^SPS^VG^IM^YR^KS^LER^HLN-----LFR^RGTLD^PTM
G. pallida NPR-13 NNMYF^KLLNVHAVAMTSIV^SNPLLYF^WMSKR^HRRLK^DDM^FW^LTN^ARRQQ^QQ^NV^GGL^LN^KFT^PSP^SI^GLL^YR^KN^VER^HLQ^NAAK^YNQQ^RRG^TL^GD^PTC
M. hapla NPR-13 IQMYF^KLLNVHAVAMTSIV^SNPLLYF^WMSKR^HRRLK^DDM^FW^LTN^ARRQQ^NH^VG^GL^LA^KFT^PSP^SI^GLL^YK^KS^LER^HLQ^NATAK^YNPY^RRG^TLAD^PTT
M. incognita NPR-13 IQMYF^KLLNVHAVAMTSIV^SNPLLYF^WMSKR^HRRLK^DDM^FW^LTN^ARRQQ^NH^VG^GL^LA^KFT^PSP^SI^GLL^YK^KS^LER^HLQ^NATAK^YNPY^RRG^TLAD^PTT

Consensus IQMYF^KLLNVHAIAMTSIV^WNPLLYF^WMSKR^HRRLK^DDM WLTN RR NN VGLL RF P^SP^SV^SL^LY^RK^TL^ER^HL NFR^RGTLD^PTC

B. malayi NPR-13 -----
W. bancrofti NPR-13 ITA^ER-AFA^HI^HAN^CFLLV^PL^LPLY^OA
D. immitis NPR-13 ITA^ET-AFA^HM^HAS^CFLLV^PL^LPLY^OA
O. volvulus NPR-13 ITA^ET-AFA^HM^HAN^CFLLV^PL^LPLY^OS
O. ochengi NPR-13 ITA^ET-AFA^HM^HAN^CFLLV^PL^LPLY^OS

<i>L. loa</i> NPR-13	ITAEK-AFAHMHANCFLLVPLIPLYQA-----
<i>A. suum</i> NPR-13	MQSEK-ALADMHANCFLLVPLMPLCRSEVNVSDSRIGLRSNDRQIVIHPSQ-----
<i>A. caninum</i> NPR-13	MSRER-AQADLHSDCFLLVPLMPLCQSV-----
<i>N. brasiliensis</i> NPR-13	MSRER-AQADLHSNCFLLVPLMPLCQSLNRRNSHLTIEDHRSGHV-----
<i>H. contortus</i> NRP-13	TMRER-AQADLHSNCFLLVPLMPLCQSVSRRDSRLTID-----
<i>C. elegans</i> NPR-13	TSRERSLPREIQSNCFLLVPLMPLCQSVTRKNSHLAINRDGIVIPQANGSSRRPSSVNTNSTRDW
<i>S. ratti</i> NPR-13	ATRDD-QLEDVKAACFLLVPLIMPFCKE-----
<i>B. xylophilus</i> NPR-13	MSRER-SLQEMHANCFLLVPLMPLC-----
<i>G. pallida</i> NPR-13	ISRER-ALQEMHANCFLLVPLMPLCVANATTLQRHH-----
<i>M. hapla</i> NPR-13	LGREK-ALQEMHANCFLLVPLMPLCVANQQHLTTNRREI-----
<i>M. incognita</i> NPR-13	LGREK-VLQEMHANCFLLVPLMPLCVANQQRLATNQREISNNNNINLNFKRQKHPKFVCEA----

Consensus ITRER A ADMHANCFLLVPLMPLCQS

12. NPR-22 homologues

T. spiralis NPR-22 -----LTADESAVAVVVYLLITVVIIGNATVIFLIGHFPLRLPTNALIANLALADLLMA
T. muris NPR-22 -----GNVVVIFVVRFRMRPTNALIANLALADTLVA
A. suum NPR-22 -----LAFLYSGLSIVVICNSLIVLVILYFRRLRTATNLIILNLAADLMIS
A. caninum NPR-22 -----ADLLIA
N. brasiliensis NPR-22 -----PSQKNFYFQVLCICFYNI LCVCSVYGNFLVILVILYFRRLRTATNLIIFNLAADLLIA
H. contortus NPR-22 MDEGGIGSSLLSRIITTTASEIMMRNEPTTENTPAVQEMNHIYHLTPSMKMLCILFVSYLCVCCVYGNVILVILVIVYFRRLRTATNLIILNLAADLLIS
C. elegans NPR-22 -----VILYILLSCIAFIGNLMIIIVILYFRKLTGTNMLIMNLAADIMIA
S. ratti NPR-22 -----MNDSAEVLELQYLCPTCKVAVVLYTTLSTMAFIGNSLIVAVIYFRRLHATNMLIMNLAADLMIS
B. xylophilus NPR-22 -----MIEQTLEYSNQPTQSGSENVPIAVQQLCLTCKLAILLSYSTLSLIFVGNALILAVFFRFKRLRPTNMLIANLAIGDLMVS
G. pallida NPR-22 -----LKWIFNSKEFN--KLKNFKINLINLNFILIKLKNKYIFILFTSIYMHIIVGNALILAVFLRFKRLRPTNMLIANLAIGDLMIS
M. hapla NPR-22 -----VGNALILAVFLRFKRLRPTNMLIANLAIGDLMIS
M. incognita NPR-22 -----VGNALILAVFLRFKRLRPTNMLIANLAIGDLMIS

Consensus

L IL YS L V A IGNALII VILYFKRLRT TNMLI NLAIAADLMIS

T. spiralis NPR-22 LLCIPFSFVSTLILQY--WPFQWFLCKVINFSQAVTVMASAYTLIAISLDRFPAILLPMSPNVKMTNRKATLCVLLVVTVAIVIAFPLLMVLTLEPS-EET
T. muris NPR-22 LLCIPFSLASTLLEY--WPFQWFLCKVIHFSQAVTVMASAYTLIAISVDRFCGILFPMSTRALTRRKAALVIAIVTWVAIAAFPLLMVLSLAASPPD
A. suum NPR-22 VLCMPFSYWHVLIIFSDQRWIFGAIFCKLFAFLQATAVFLSSWTLVAISFDRFTAIMFMSPPWRLTRRRALYLVAITWIFSLIMAPLFYVNOIQR---R
A. caninum NPR-22 -----VFGSAMCSLLSFPFG-AVFLSSWTLVVISFDRWMAIMFVLSPSMRLTRKRAVYLVLATWAFSITMALPLFLVAQITTT---T
N. brasiliensis NPR-22 VFCIPFSYQVLIIFDQRWVFGSAMCSLLSFFK-----
H. contortus NPR-22 VFCIPFSYQVLIIFDQRWVFGSAMCSLLSFFCGIAVFLSSWTLVVISFDRWMAIMFVLSPSMRLTRRRAVYLVLATWAFSITMALPLFLVSKHTHT---T
C. elegans NPR-22 VFCIPFSYQVLIYDQRWVFGSMMSLLAFLQAMAVFLSAWTLVVISFDRWMAIMFLLTPTNRIITRRRALYLVAATWIFSLIMALPLIFTRFFED--Q
S. ratti NPR-22 LICMPFSYWHVLIIFEDSKWIFGSLFCKLLNFQATAVFSWTLVATRFDRCLAIFVMSRWNLNKKRALYVIFITIIWFFSLLMACPLYFANEVWSHEGN
B. xylophilus NPR-22 LFCMPLSYWHVLIIFEDQRWIFGAFCLKIFNQLQASAVFLSSWTLVVISFDRFMAIMFVMSPPWRLTRKRAFLLIGTWVFSLAMALPLLIVNQTEAS--A
G. pallida NPR-22 VFCIPLSYWHVLIIFEDQRWIFGAFCLKCFNYLQATAVFLSSWTLVAISFDRFMAIQFAMSPWLKMTRRRALYALIGTWVFSLGALPLLIVNKLSHS--S
M. hapla NPR-22 LFCIPLSYWHVLIIFEDQRWIFGAFCLKTFNYLQATAVFSWTLVVAISFDRFMAIQFMSPPWLKMNRRKRALYATLITWGFSLIMALPLLIVNQLESST--T
M. incognita NPR-22 LFCIPLSYWHVLIIFEDQRWIFGAFCLKTFNYLQATAVFSWTLVVAISFDRFMAIQFMSPPWLKMNRRKRALYATLITWGFSLIMALPLLIVNQLESST--S

Consensus

VFCIPFSYWHVLIIFEDQRWIFGAFCLKLLNFLQATAVFLSSWTLVAISFDRFMAIMFVMSPPWRLTRRRALYLVLITW FSLIMALPLLIVN L S T

T. spiralis NPR-22 GDVTHCIENITWT---ANETTGEYEYSLAAMLQYFVPLLVLITLYAGIGMKIWFHVPGEQGYAGQCN-----RERKTLVKKVIPTMFTVITAVY
T. muris NPR-22 DTILYCAENITW----ANETTGEYEYSLAAMCLQYFVPLLVLITLYAGIGLKLWFS----EGHAGRFS-----RQRKSMVKKVLPMTFIVTIVY
A. suum NPR-22 DGVDTCIEYGWQYLES-KFGDGITHYVGTIVVFSLQYCLPLTVLIIISYASIGVKMWNSS--RVPGVQP-----STRCVVNERHESVKKMIRMVLLVSALY
A. caninum NPR-22 GGIKRDEDWTAVEAF---IPGSRRLYSYLLVLVQYVPLTVLIIITYFVIGKMWNS--RIPGPTS-----STKKVMERHESVKKLIPMVLISAMF
N. brasiliensis NPR-22 -----
H. contortus NPR-22 DGIKRDEDWSS-----QSRRLYSYLLVLVQYVPLTVLIIITYFVIGKMWNS--RIPGPTS-----STKKVMERQESVKKLIPMVLISAMF
C. elegans NPR-22 DGLPNCGENITYFGDS---GEQVRKYSSMLLILQYVVPQAVLIIITYTHIGIKMWNS--RVPGMQNG-----ATKKMIVDRHESVKKLIPMVLISALF
S. ratti NPR-22 DNTDTCVEKWNLLKVFSGDETKIVSLNKSLEFVLQYCMPLVILVITYYIIGFKMWFS--ETPGADSCSQASKRNTKTLIQERHESVKKLIPMVLISALY
B. xylophilus NPR-22 LDVETCQEKWELLSPL-GDVQIVHSYTSALFALQYCLPLFVLVITYYFVIGLKMWNS--KVPQADRT-----QSTRYVYQGRHDSVKKLIPMVLISALY

G. pallida NPR-22 DGVDTCLEQWEHFFS-----ANFVSYMTSSLEGLQYCLPLAVLLITYTAIGCKMWNSSG-KVPGGES-----YLPPRASNKLKESVKKLIPMVLVLSALY
M. hapla NPR-22 EGVDTCLEKWNDFFS-----DSFVSYLTSSLEFALQYCLPLSVLLITYTAIGCKMWNSS--KVPGR-----KESVKKLIPMVLVLSALY
M. incognita NPR-22 EGVDTCLEKWNDFFS-----DSFVSYLTSSLEFALQYCLPLSVLLITYTAIGCKMWNSS--KVPG-----KLIPMVLVLSALY

Consensus DGVDTC E W LYSSSLF LQYCLPL VLIITYT IGMKWNSS KVPG S K VV ER ESVKKLIPMVLVLSALY

T. spiralis NPR-22 TFCWLEIN-VFNVVRAHPSVTDSTYVLHIWVAHTIAMVHCLVNPITYICRNRRFREGFAF-----
T. muris NPR-22 SFCWLELN-VFNILRALYPLINEYTYVLHVWVAHTVAMVHCWVNPITYVSRNRRFREGFAY-----
A. suum NPR-22 ACCWLPQNLLINILPLNPNIVSHPYILYFVWMAHTIAMLHSTVNPVFVYTRNARFQEGICYFI-RFLPCVK-----
A. caninum NPR-22 AFCWLELLLLINVIIDLWPSVASWRVYIYIWWFSGHGLAMHSMVNPVYVFLRNARFREGFCYFS-RFLPCVHFQEFKLSAQAKSGRSR-----
N. brasiliensis NPR-22 -----
H. contortus NPR-22 AFCWLELLLLINVIIDLWPSVASWKFILYMWVFSHGLAMHSMVNPVYVFLRNARFREGFCYFS-RFLFVHFSGFKLITDQN-----
C. elegans NPR-22 ALCWLELLLLINVIPEFYDINSWGYILYLWFAHGLAMHSMVNPITYFIRNARFREGFCFSSKLLPCLISFKELRLITDNTSRFRNRSRFSGVINPT
S. ratti NPR-22 AGCWLPQNLLMNVLVN-DTDILTTPYILFIWVAHTIAMFHSVNPFIYYQNRMRREGLRYLL-RWLPCTVTFTEFKLLA-----
B. xylophilus NPR-22 AGCWLPQNLLMNIWVTYDPTITSHPYILYIWWAHTIAMFHSVNPFIYYWQNRRIINEGVRYLL-RFLFPIHFDNFHYIEKPGCRAVKFVNMVAYMPVA
G. pallida NPR-22 AVCWLPQNLLMNIWVTYDPSALNYPYIYIWWGAHTIAMFHSVNPVFVYVTRRRIHAALKHLL-RWLPCLRARNMAIAEFDARKR---LASSFRYVSA
M. hapla NPR-22 AVCWLPQNLLMNIWVTYDPSALNYPYIYIWWGAHTIAMFHSVNPVFVYVTRRRIHAALKHLL-RWLPCLRARNMAIAEFDQATARQKAVTNSFKYPIG
M. incognita NPR-22 AVCWLPQNLLMNIWVTYDPSALNYPYIYIWWGAHTIAMFHSVNPVFVYVATNRRRIHAALKHLL-RWLPCLRARNMAIAEFDQATARQKAVTNSFKYVPV

Consensus A CWLPQNLLMNILV PSI SHPYILYIWWAHTIAM HSI VNPVFVY RNRRFREGL Y L RFLPCV L E

T. spiralis NPR-22 -----
T. muris NPR-22 -----
A. suum NPR-22 -----
A. caninum NPR-22 -----
N. brasiliensis NPR-22 -----
H. contortus NPR-22 -----
C. elegans NPR-22 SSDEKPATSLTRYSRSGVLDROTCRSARFFEARPLVVVRNNSANSLA
S. ratti NPR-22 -----
B. xylophilus NPR-22 GKKVLHSTVSDSG-----
G. pallida NPR-22 DQHRRRTTLQKTGSGSWHDATVPQ-----
M. hapla NPR-22 DNRRLLTHTQKTISLTMD-----
M. incognita NPR-22 DSRRLTLHTQKTISLSMD-----

Consensus

13. DMSR-1 homologues

<i>B. malayi</i> DMSR-1	MNNLERCQTV-IIELEPENSIVYDWFYAIHTFYSPPIHTYLSIIVLCILGAMCNFCNIVVLTR-KRMRTPVNMTLTAMACCDTVVLF SNLIYTTHTYTLAFAFAN
<i>W. bancrofti</i> DMSR-1	MNNLERCQTV-IIELEPENSIVYDWFYAVHNFYSPPIHTYLSIIVLCILGAMCNFCNIVVLTR-KRMRTPVNMTLTAMACCDTVVLF SNLIYTTHTYTLAFAFAN
<i>D. immitis</i> DMSR-1	MNDLERCQTV-IIELEPERSIVYDWFYAIHNFYSPPIHTYLSIIVLCILGAMCNFCNIVVLTR-KRMRTPVNMTLTAMACCDTVVLF SNLIYTTHTYTLAFAFAN
<i>O. volvulus</i> DMSR-1	-----CQTV-IIELEPERSIVYDWFYAIHTFYRPIHAYLSIIVLCILGAMCNFCNIVVLTR-KRMRTPVNMTLTAMACCDTVVLF SNLIYTTHTYTLAFAFAN
<i>O. ochengi</i> DMSR-1	MSNLKRCQTV-IIELEPERSIVYDWFYAIHTFYRPIHAYLSIIVLCILGAMCNFCNIVVLTR-KRMRTPVNMTLTAMACCDTVVLF SNLIYTTHTYTLAFAFAN
<i>L. loa</i> DMSR-1	MNTLERCQTV-IIELEPENSIVYDWFYAIHTFYSPPIHTYLSIIVLCILGAMCNFCNIVVLTR-KRMRTPVNMTLTAMACCDTVVLF SNLIYTTHTYTLAFAFAN
<i>A. suum</i> DMSR-1	MNALDQCQTV-IVQLPAESIVYEWLYGIHTFYRPIHTYLSIIVLCILGAMCNFCNIVVLTR-KRMRTPVNMTLTAMACCDTVVLF SNLIYTTHTYTLAFAFAN
<i>A. caninum</i> DMSR-1	-----R-----KRMRTPVNMTLTAMACCDTVVLF SNLIYTTHTYTLAFAFAN
<i>N. brasiliensis</i> DMSR-1	-MDTDQCQTV-LVHLEPNHNVYDFPREVHLYFKYPIHTYLSIIVLCILGAMCNFCNIVVLTR-KRMRTPVNMTLTAMACCDTVVLF SNLIYTTHTYTLAFAFAN
<i>H. contortus</i> DMSR-1	-MDADQCQTV-LVHLEPNHNVYDFPREVHLYFKYPIHTYLSIIVLCILGAMCNFCNIVVLTR-KRMRTPVNMTLTAMACCDTVVLF SNLIYTTHTYTLAFAFAN
<i>C. elegans</i> DMSR-1	-MEFTECKIT-FIHLFDKSFYLDVFSVYNFYHPIHAYLSIIVLCILGAMCNFCNIVVLTR-KRMRTPVNMTLTAMACCDTVVLF SNLIYTTHTYTLAFAFAN
<i>S. ratti</i> DMSR-1	-----CSTV-IIELEPENSIVYDILKTVSDYFKYPIHAYLSIIVLCILGAMCNFCNIVVLTR-KRMRTPVNMTLTAMACCDTVVLF SNLIYTTHTYTLAFAFAN
<i>B. xylophilus</i> DMSR-1	-----CQTV-VFQLNESVIYDRLADLHAFYKPIHTYLSIIVLCILGAMCNFCNIVVLTR-KRMRTPVNMTLTAMACCDTVVLF SNLIYTTHTYTLAFAFAN
<i>G. pallida</i> DMSR-1	MDPLHQCSID-VFQLDQSPFYELKTIKDFYKPIHTYLSIIVLCILGAMCNFCNIVVLTR-KRMRTPVNMTLTAMACCDTVVLF SNLIYTTHTYTLAFAFAN
<i>M. hapla</i> DMSR-1	MDLLQQCQTSFFQLTESWVYVLLAIKDFYKPIHTYLSIIVLCILGAMCNFCNIVVLTR-KRMRTPVNMTLTAMACCDTVVLF SNLIYTTHTYTLAFAFAN
<i>M. incognita</i> DMSR-1	MDLLQQCQTSFFQLTESWVYVLLAIKDFYKPIHTYLSIIVLCILGAMCNFCNIVVLTR-KRMRTPVNMTLTAMACCDTVVLF SNLIYTTHTYTLAFAFAN
Consensus	M L CQTV II LPE SIVYDWF AIH FYKPIHTYLSIIVLCILGAMCNFCNIVVLTR KRMRTPVNMTLTAMACCDTVVLF SNLIYTTHTYTLAFAFAN

<i>B. malayi</i> DMSR-1	CHPKQWSYGVAVFLVCHAHLSLIGHSSSIWLSVMLALIRYMTLRSRKKVNVVQIHLRHSYMAIAFVVFVTLNMTPNFLAYKIEEMKLGSETCNTTDTGNY
<i>W. bancrofti</i> DMSR-1	CHPKQWSYGVAVFLVCHAHLSLIGHSSSIWLSVMLALIRYMTLRSRKKVNVVRIHLRHSYMAIAFVVFVTLNMTPNFLAYKIEEMKLGSETCNTTDTGNY
<i>D. immitis</i> DMSR-1	CHPEQWSYGVAVFLVCHAHLSLIGHSSSIWLSVMLALIRYMTLRSRKKVNVVQIHLRHSYMAIAFVVFVTLNMTPNFLAYKIEEMRLSETCNTTDTGNY
<i>O. volvulus</i> DMSR-1	CHPEQWSYGVAVFLVCHAHLSLIGHSSSIWLSVMLALIRYMTLRSRKKVNVVQIHLRHSYMAIAFVVFVTLNMTPNFLAYKIEEMRLSETCNTTDTGNY
<i>O. ochengi</i> DMSR-1	CHPEQWSYGVAVFLVCHAHLSLIGHSSSIWLSVMLALIRYMTLRSRKKVNVVQIHLRHSYMAIAFVVFVTLNMTPNFLAYKIEEMRLSETCNTTDTGNY
<i>L. loa</i> DMSR-1	CHPKQWSYGVAVFLVCHAHLSLIGHSSSIWLSVMLALIRYMTLRSRKKVNVVQIHLRHSYMAIAFVVFVTLNMTPNFLAYKIEEMRLSETCNTTDTGNY
<i>A. suum</i> DMSR-1	CHPRHWSYGVAVFLVCHAHLSLIGHSSSIWLSVMLALIRYMTLRSRGNMNGVQIHLRHSYMAIAFVVFVTLNMTPNFLAYKIEEMRLNETCEIKDESVR
<i>A. caninum</i> DMSR-1	CHPRHWSYGVAVFLVCHAHLSLIGHSSSIWLSVMLALIRYMTLRSRGNMNGVQIHLRHSYMAIAFVVFVTLNMTPNFLAYKIEEMRLNETCEIKDESVR
<i>N. brasiliensis</i> DMSR-1	CHPRHWSYGVAVFLVCHAHLSLIGHSSSIWLSVMLALIRYMTLRSRGNMNGVQIHLRHSYMAIAFVVFVTLNMTPNFLAYKIEEMRLNETCEIKDESVR
<i>H. contortus</i> DMSR-1	CHPRHWSYGVAVFLVCHAHLSLIGHSSSIWLSVMLALIRYMTLRSRGNMNGVQIHLRHSYMAIAFVVFVTLNMTPNFLAYKIEEMRLNETCEIKDESVR
<i>C. elegans</i> DMSR-1	CHPKHWSYGVAVFLVCHAHLSLIGHSSSIWLSVMLALIRYMTLRSRGNMNGVQIHLRHSYMAIAFVVFVTLNMTPNFLAYKIEEMRLNETCEIKDESVR
<i>S. ratti</i> DMSR-1	CHPRDWSYGVAVFLVCHAHLSLIGHSSSIWLSVMLALIRYMTLRSRGNMNGVQIHLRHSYMAIAFVVFVTLNMTPNFLAYKIEEMRLNETCEIKDESVR
<i>B. xylophilus</i> DMSR-1	CHPRHWSYGVAVFLVCHAHLSLIGHSSSIWLSVMLALIRYMTLRSRGNMNGVQIHLRHSYMAIAFVVFVTLNMTPNFLAYKIEEMRLNETCEIKDESVR
<i>G. pallida</i> DMSR-1	CVPKNWSYGVAVFLVCHAHLSLIGHSSSIWLSVMLALIRYMTLRSRGNMNGVQIHLRHSYMAIAFVVFVTLNMTPNFLAYKIEEMRLNETCEIKDESVR
<i>M. hapla</i> DMSR-1	CIPKHWSYGVAVFLVCHAHLSLIGHSSSIWLSVMLALIRYMTLRSRGNMNGVQIHLRHSYMAIAFVVFVTLNMTPNFLAYKIEEMRLNETCEIKDESVR
<i>M. incognita</i> DMSR-1	CVPKHWSYGVAVFLVCHAHLSLIGHSSSIWLSVMLALIRYMTLRSRGNMNGVQIHLRHSYMAIAFVVFVTLNMTPNFLAYKIEEMRLNETCEIKDESVR
Consensus	CHPKHWSYGVAVFLVCHAHLSLIGHSSSIWLSVMLALIRYMTLRSRGNMNGVQIHLRHSYMAIAFVVFVTLNMTPNFLAYKIEEMRLNETCEIKDESVR

B. malayi DMSR-1 D-ASAYVPGVSDLAIQAHCLIFR-MAFWISGTVFKMTPCLLIS-SFVWLLMKILTRVQQNR--LKKLIYHSTRFYNG-KHESKKHRGQS-----

W. bancrofti DMSR-1 D-ASAYVPGVSDLAL^EAHCL^IFR-MAFWIS^GTVFK^IPCLL^LS-SFVWLLMK^ILTRV^QQNR--LKLL^YHSTRFY^NG-KYES^KKKNR^GQS-----
D. immitis DMSR-1 D-ASAY^IPGVSDLAL^EAHCL^IFR-MAFWIS^GTVFK^IPCLL^LS-SFVWLLMK^ILTKV^QQNR--LKLFY^HSTHFC^NG-KYHD^KKDYQ^RNRKNAID-----
O. volvulus DMSR-1 D-AFAY^IPGVSDLAL^EAHCL^VFR-MAFWIS^GTVFK^IPCLL^LS-SFVWLLMK^ILTKV^QQNR--LKLL^YNSRYC^DGKKY^DDKAYQ^RNRK-----
O. ochengi DMSR-1 D-AFAY^IPGVSDLAL^EAHCL^VFR-MAFWIS^GTVFK^IPCLL^LS-SFVWLLMK^ILTKV^QQNR--LKLL^YNSRYC^DGKKY^DDKAYQ^RNRK-----
L. loa DMSR-1 D-AFAY^IPGVSDLAL^EAHCL^IFR-MAFWIS^GTVFK^IPCLL^LS-SFVWLLMK^ILTRV^QQNR--VKLL^HSTYY^NO-KYV^GKKYC^GKEK^IPLIR^IYQ^L-----
A. suum DMSR-1 Y-APAY^IPGVSDMAV^QAYCL^VFR-MAFWIS^GTVFK^VPCLL^LT-LFVWLLMR^ILNEV^KQNR--LRL^MEK^SSRP^SND^GSSPK^MQADD-----
A. caninum DMSR-1 G-AAAYLPGIAEIALAKHCLVFR-LVFWISGLVFKVIPCLLS-----
N. brasiliensis DMSR-1 G-AAAYLPGIAEIALAQHCLVFR-LVFWISGLVFKVIPCLLS-LFVWLLGILK^EVKANR--QRL^LKNSRN^SSV^PATAP^ANGK--VTLV^ASN-----
H. contortus DMSR-1 G-AAAYLPGIAEIALAKHCLFR-LVFWISGLVFKVIPCLLS-LFVWLLGILK^EVKANRE^RL^LKNSHH^AMPP^ANS--NGK--VVLV^AH-----
C. elegans DMSR-1 N-SPAYLPGIADIAKANSCLVFR-LSYWISGMVFKVIPCLLS-LFVWLLRILREV^ENR--QRL^LKNSQ^HR-PPN^QTTT^TNG^QRLS^ISVAG^N-----
S. ratti DMSR-1 N-ASAYLTGISELAVNSCMVFR-LTFWMSGILFKVIPCLILT-LVWLLTRILNEV^KQNR--LKL^FKGS^SKYSP^PSESL^TKHD^NNLF^ISS^SP-----
B. xylophilus DMSR-1 A-ALAYFPEVSDLAL^ETNCLVFR-MAFWIS^GTVFK^IPCLL^LT-LFVWLLTRILNEV^KENR--ARL^MK-----GNC-----
G. pallida DMSR-1 KNNDTAYVPGVAD--VAAD^CLVFR-LAFWITGAVFQIFPCLLILTLLVSLLMRILREV^RDNR--QRL^FLAG^RGAAA^ASGGG-----
M. hapla DMSR-1 RNHTAYVPGVAD--IASD^CLVFR-LAFWITGAVFKIFPCLLILT-VLVSLLTQILKEV^RTNR--QRL^FFGG^CSS^STFEAN^V-----
M. incognita DMSR-1 KNHTAYVPGVAD--IASD^CLVFR-LAFWITGAVFKIFPCLLILT-VLVSLLTQILKEV^RANR--QRL^FFGG^CSS^STFEAN-----

Consensus A AYIPGVSDLALAAHCLVFR MAFWISGTVFKVIPCLLS LFWLLMKIL EVK NR LRL S G K

B. malayi DMSR-1 ----KTDTAKINTSIVYRADR^TTRML^LTILCVFLIT^ELPQGIMMVL^SGILPEAFRR^HIYNSLGDLLD^LSLC^NSCTTF^VIYCSM^SEQFRNE^FKQVFLP^NS
W. bancrofti DMSR-1 ----KIDTAKINTSIVYRADR^TTRML^LTILCVFLIT^ELPQGIMMVL^SGILPEAFRR^HIYNSLGDLLD^LSLC^NSCTTF^VIYCSM^SEQFRNE^FKQVFLP^HS
D. immitis DMSR-1 -----SCYSKINTDTIYRADR^TTRML^LTILCVFLIT^ELPQGIMMVL^SGILPEAFRR^HIYNSLGDLLD^LSLC^NACTTF^VIYCSM^SEQFRNE^FKQVFLP^NS
O. volvulus DMSR-1 -----RTNASTVYRADR^TTRML^LTILCVFLIT^ELPQGIMMVL^SGILPEAFRR^HIYNSLGDLLD^LSLC^NACTTF^VIYCSM^SEQFRNE^FKQVFLP^YS
O. ochengi DMSR-1 -----RTNASTVYRADR^TTRML^LTILCVFLIT^ELPQGIMMVL^SGILPEAFRR^HIYNSLGDLLD^LSLC^NACTTF^VIYCSM^SEQFRN--KQVFLP^YS
L. loa DMSR-1 IVVPRMINFINTSVVYRTDR^TTRML^LTILCVFLIT^ELPQGIMMVL^SGILPEAFRR^HIYNSLGDLLD^LSLC^NACTTF^VIYCSM^SEQFRNE^FKQVFLP^NS
A. suum DMSR-1 --NHSFKQASHVRC--GERTDR^TTHMLLAI^VFVFLVTEL^PQGVMAVLSG^MFSEEFRR^HIYNNLGD^LLDL^LSLC^GACTTF^VIYCSM^SEQFRNE^FRRVFLP
A. caninum DMSR-1 -----S-----DRTTYMLIIMLVVFLVTEL^PQGFALING-----
N. brasiliensis DMSR-1 DQHKRTSSIRLAPPRGERADRT^TNMLLAI^VFVMLFTEMPQ^GIMALLSG^MISEEFR^HIYNNLGDLLD^LFLS^CEAC^MSFIIYCSM^SGQFRNE^FHRVFP
H. contortus DMSR-1 DKHHR^TSSVGR--GERADRT^TNMLLAI^VFVMLFTEMPQ^GIMALLSG^MISEEFR^HIYNNLGDLLD^LFLS^CEAC^MSFIIYCSM^SGQFRNE^FRRVFP
C. elegans DMSR-1 EKLGR^NSLGR--GERVDR^TTHMLLAI^VAVMLVTEL^PQGVMAVLSG^MCSEEFRI^IYNNLGD^LLDL^FSLC^GSCCFIIYCSM^SGQFRNE^FHRVFP
S. ratti DMSR-1 MPKMS^SGK^ISKG^GKHAKTDR^TTRML^LTIVCVFLIT^ELPQGVMAVLTG^IFSDEFRI^HIYNSFG^DLDL^MALC^NACTTF^VIYCT^MSSQFR^TEFO^KVFMPEK
B. xylophilus DMSR-1 -----RADR^TTRMLLAI^VCVFLVTEL^PQGVMAVLTG^ILSQEFR^NIYNNVGD^ILDL^LSLC^EACTSFIIYCSM^SGQFRNE^FRRVFP
G. pallida DMSR-1 -----SRTDR^TTRMLLAI^VCVFLIT^ELPQGVMAVLTG^MFSEEFHY^NIYNRVGD^ILDL^LSLC^NACTSFIIYCT^MSAQFRNE^FRRVFLPAY
M. hapla DMSR-1 -----HRTDR^TTRMLLAI^VCVFLVTEL^PQGVMAVLSG^MFSEEF^RSHIYNNLGD^ILDL^LSLC^NALAS^FIIYCSM^SAQFRNE^FRRVFLPTT
M. incognita DMSR-1 -----RTDR^TTRMLLAI^VCVFLVTEL^PQGVMAVLSG^MFSEEF^RSHIYNNLGD^ILDL^LSLC^NALAS^FIIYCSM^SAQFRNE^FRRVFLPTT

Consensus R RADRTRMLLAI^VCVFLIT^ELPQGVMAVLSGILSEEFRRIYNSLGDLLD^LSLC^NACTTF^VIYCSM^SGQFRNE^FRRVFLP S

B. malayi DMSR-1 FFDHKL^RWNL^KRNYKES-----SS--HSTTD^ASSKNA^FLPRN^VLD^RNI^EGVCP^AVTAT^SELPMESS^MTWSQ^CAAEN^NLPEK^LNTN^IGN^TENDE^DAS
W. bancrofti DMSR-1 FFDYKL^RWK^LKRNYKES-----SS--HSTTS^ASFKNA^FLPRN^ALNR^NIE^GVCP^AVTAT^SELPMESS^MIWSQ^Y-AEN^NVE^PEK^SNR^NIGN^MVN^DEG^PS
D. immitis DMSR-1 LFGFK^LK^WSK^RDYK-----
O. volvulus DMSR-1 LFGYK^LK^WSK^QG^YK^QP-----SSAQ^SSTGT^NSK^TNFLH^WYV^L-RNT^KHNG^PLV^SVT^SELPMEG^PW^LNY^VG----NDLE^KLST^NIGN^IENDE^AYS
O. ochengi DMSR-1 LFGYK^LK^WSK^QG^YK^Q-----RNT^KHNG^PLV^SVT^SELPMEG^PW^LNY^VG----NDLE^KLST^NIGN^IENDE^ACS

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L. loa DMSR-1 LFQYKLRKLRQWNHKES-----SSSTHSSNGRNSKNIFLIPANILNRNTKDVCPMVTATSEILMESSLT-----
A. suum DMSR-1 SSVLQFLSRSNRRSSEPLVKQCYLRPSDAANGNTSTAERSITMTLVGVSASIRKVKTKSNNPPASVCTDSLQRMSSSDSVASPTPKSPPSTAAFNFQSAS
A. caninum DMSR-1 -----
N. brasiliensis DMSR-1 KSMHCLERP-VSVR-----RPSETY--TKMTYLKPTVYEN--GSSTYSELDRSGAVKVIQNSSSR-----LDIRGTPSPGFYGSST
H. contortus DMSR-1 KSMHCLERP-PSIR-----RPSDAY--TKMTYLRPTVYEN--GSSTYSELKNAVVKVIG-KLISNF-----IELSFGEIVN-SYGLSA
C. elegans DMSR-1 AKVRCIRMSSPSIR-----RPSDAYSTTKMTFLKPNIKNGMNGMNGTYSEDTRSASVKMVGIQVRRNSTEITRMTGCDISITPCSPMPTSFPPSP
S. ratti DMSR-1 LNNACKIPWNKRSR-----RESVPFTENK-----
B. xylophilus DMSR-1 AQVSCWWSPTAR-----RYSDALFSKTGTQFLQ-----
G. pallida DMSR-1 GRMKCWHRFV-----
M. hapla DMSR-1 QRVKCWHQLFVLTR-----RTRNDAKRNNENKLERKQES--GCE-----
M. incognita DMSR-1 QRVKCWHQLLVLTR-----RKRNDVEN-IKFEGROESGGGCE-----

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Consensus

V CLK R S E L

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B. malayi DMSR-1 LLHSSA-----
W. bancrofti DMSR-1 LLHSSA-----
D. immitis DMSR-1 -----
O. volvulus DMSR-1 V-----
O. ochengi DMSR-1 V-----
L. loa DMSR-1 -----
A. suum DMSR-1 TARISSASHETLDDKSDRLDEKAELLSESCPTKRPCAGILDNKKKGRLEARYHV
A. caninum DMSR-1 -----
N. brasiliensis DMSR-1 LNEAT--AAGFDDERSRLID-----
H. contortus DMSR-1 LEMVP--LTVTVIPNS-----
C. elegans DMSR-1 LPPIRSGEDESTDETSHELLNSSGPNSTASADGIRGHFQNI-----
S. ratti DMSR-1 -----
B. xylophilus DMSR-1 -----
G. pallida DMSR-1 -----
M. hapla DMSR-1 -----
M. incognita DMSR-1 -----

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Consensus

14. DMSR-2 homologues

<i>T. spiralis</i> DMSR-2	MVAWIIDNETKGYAERADREAEDAAWVSSG	I AFTN	SYGF	I HAYL	S P I T	C C I G L A N A T T I V V L	T R P A M R T S - V N V I	L A A M A A C H A T T M L T Y L I F T L R T N
<i>T. muris</i> DMSR-2	-----WIRNE	V F I A N A Y G Y V	H G Y L S T L I C V L G I L A N F A T I A V L	T R P A M R T S - V N I I	L A G I A A C H A V T M F T Y F I F T L R G M			
<i>B. malayi</i> DMSR-2	-----I	P L A S A Y L P	I H I F L Y H F L C I T G V F A N I A I V V V L L R P A M R K N H F N A F L I A I A I C D M T L M A S Y F I F K Q V E I					
<i>W. bancrofti</i> DMSR-2	-----I	P L T S A Y L P	H I F L Y H F L C I T G V F A N I A I V V V L L R P A M R K N H F N A F L I A I A I C D M T L M A S Y F I F K Q V E I					
<i>D. immitis</i> DMSR-2	-----P	L A S A Y L P	I H I F L Y H F L C I T G V F A N I A I V V V L L R P A M R K N H F N T F L I A I A I C D M T L M A S Y F I F K Q V E I					
<i>O. volvulus</i> DMSR-2	-----P	L A S A Y F P	I H I F L Y H V L C I T G V F A N I A I V V V L L R P A M R K N H F N T F L I A I A I C D M T L M A S Y F I F K Q V E I					
<i>O. ochengi</i> DMSR-2	-----P	L A S A Y F P	I H I F L Y H V L C I T G V F A N I A I V V V L L R P A M R K N H F N T F L I A I A I C D M T L M A S Y F I F K Q V E I					
<i>L. loa</i> DMSR-2	-----I	P L A N A Y L P	I H I F L Y H F L C I T G V F A N I A I V V V L L R P A M R R N H F N A F L I A I A I C D M T L M A S Y F I F K Q V E I					
<i>A. suum</i> DMSR-2	-----SCMG--LNESAIEEQKVYAKL	S S A V Q A Y T P	V H V F V Y Q F L C I T G V F A N I S I I V V L L R P A M R K N P F N A F L I A I A I C D M T L M A F Y F I Y K Q V E I					
<i>A. caninum</i> DMSR-2.1	-----MSCMGLALNASERLQLRDYYRQI	L D F T A V F S E	I H A Y L Y V F L C V V G V F A N I A I V V V L L R P A M R R S P F N L F L I C I A I C D A T L M A T Y L L Y K H V G L					
<i>A. caninum</i> DMSR-2.2	-----MSCMGLALNVSELDELRDYYRQI	L A F T N V F S Q	I H S Y L Y V F L C V V G V F A N I A I V V V L L R P A M R R S P F N L F L I C I A I C D A T L M A T Y L L F K H V E M					
<i>N. brasiliensis</i> DMSR-2	-----MSCMGLALNASELDELREYRQI	L A F T N V F S Q	I H S Y L Y V F L C V V G V F A N I A I V V V L L R P A M R R S P F N L F L I C I A I C D A T L M A T Y L L F K H V E F					
<i>H. contortus</i> DMSR-2	-----MSCMG--LNTTELQEARDYFRQL	L L F T A S F T M F	H N Y I Y V F L C V I G V F A N I S I V V V L L R P A M R K S P F N L F L V V I A V C D A S L M A T Y L T Y K H V E I					
<i>C. elegans</i> DMSR-2	-----MSCSVEVNETERDAMIQYVLEL	E G E E I Q M Y D K	I H V Y I Y Q I L C L L G V P L N V L V I V V L L R P Q M R K N P F N L Y L I V I A I C D L I L M A N Y Y I F H F I E R					
<i>S. ratti</i> DMSR-2	-----DIRHNQNTIFQL	L Q F V L S F	N Q F V L I Y K F L C I L G V L S N I C I V V V L M R P A M R R N P F N V F L V A I A I C D M T L M A S Y F V F K Q V E D					
<i>B. xylophilus</i> DMSR-2	-----KESEKACPFFTQL	N G L S E S Y N T F	H R F T Y H F L C I T G V I A N I C F V V V L L R P T M R K N P F N L F L I A I A I C D M T L M A S Y F M Y K Q V E M					
<i>G. pallida</i> DMSR-2	-----CTD--LDEESVKQSQIYYTEL	S S L S E R Y D S F	H K I I Y Q T I C I L G V I A N I C V V V V L L R P T M R K N P F N L F L I G I A I C D M S L M A S Y F I Y K Q I E I					
<i>M. incognita</i> DMSR-2	-----O I E I							
Consensus		L P L A Y I H F L Y F L C I L G V F A N I A I V V V L L R P A M R K N F N L F L I A I A I C D M T L M A S Y F I F K Q V E I						
<i>T. spiralis</i> DMSR-2	L T N K C Y F	P V Y D T Y F W L V F V V M	H A D L S V T L H S V S L W L T V D L A I V R Y L V L R R P	---	Q A A T V A N A P R T G I W I M L V T V V A V C A C C F L N F L R N S I G A R P A P E S L			
<i>T. muris</i> DMSR-2	LLNECNVHI	S S Y M W Q A I V V T H A D L S V L I Q S I S L W L T V A L A V R Y L V L R R P	---	R A A V A N A A R I G L T I I A G T S V A V C G L C F L N F L R N S I Y E R - S F R M F				
<i>B. malayi</i> DMSR-2	CH	P W Y F T Y F W I V F T Y F Y A I L S V F V H S S L W L T V N M A V L R Y L V L K R S A T S T S K I P I V N T F R A A F I A I I A A I V I S L L G S L P N M L R Y Q I R D S G Y L N V P						
<i>W. bancrofti</i> DMSR-2	CH	P W Y F T Y F W I V F T Y F Y A I L S V F V H S S L W L T V N M A V L R Y L V L K R S A T S T S K I P I V N T F R A A F I A I I A A I V I S L L G S L P N M L R Y Q I R D S G Y L N V P						
<i>D. immitis</i> DMSR-2	CH	P W Y F T Y F W I V F T Y F Y A I L S V F V H S S L W L T V N M A V L R Y L V L K R S A T S T S K I P I V N T F K A A F I A I I A A I I I S L L G S L P N M L R Y Q I R D S G Y L N V P						
<i>O. volvulus</i> DMSR-2	CH	P W Y F T Y C W I V F T Y F Y A I L S V F V H S S L W L T V N M A V L R Y L V L K R S S T S T S K I P I V N T F K A A F I A I I A A I I I S L L G S L P N M L R Y Q I R D S G Y L N V P						
<i>O. ochengi</i> DMSR-2	CH	P W Y F T Y C W I V F T Y F Y A I L S V F V H S S L W L T V N M A V L R Y L V L K R S S T S T S K I P I V N T F K A A F I A I I A A I I I S L L G S L P N M L R Y Q I R D S G Y L N V P						
<i>L. loa</i> DMSR-2	CH	P W Y F T Y F W I V F T Y F Y A I L S V F V H S S L W L T V N M A V L R Y L V L K R S A T S T S K I P I V N T F K A A F I A I I A A I I I S L L G S L P N M L R Y Q I R D S G Y L N V P						
<i>A. suum</i> DMSR-2	CH	P T Y F S Y F W I V F T Y M Y A I L S V F V H S V S L W F T V N M A L R Y L V L K R S S I S R S S I F N V N S F S A A F V A I V L A I L I S F L G S A P N M L R Y Q I R D N G F L D V P						
<i>A. caninum</i> DMSR-2.1	CH	P W F F S H A W M I Y T K F Y A M F S V F V H S A S L W F T V N M A V M R Y L V L Y R G S H S H R L P P C N S Y P A A C I A I V I C A V I A L I G S L P N M L R Y K I E L V R E M P V P						
<i>A. caninum</i> DMSR-2.2	CH	P W F F T H A W M I Y T R F Y A M F S V F V H S A S L W F T V N M A V M R Y L V L Y R G S H P H S R L P P C N G Y P A A C V A I A V G V V I A L I G S L P N M L R Y R I K F V E E M A V P						
<i>N. brasiliensis</i> DMSR-2	CH	P W F F S H V W M I Y T R F Y A M F S V F V H S A S L W F T V N M A V M R Y L V L Y R G S H A H S R L P P C N G Y P A A C V A I I V G A V I A L I G S L P N M L R Y R I K F V K E M P V P						
<i>H. contortus</i> DMSR-2	CH	P W Y F S F P W A I Y T K F Y A I F S V F V H S C S L W L T V N M A L R F L V L Y R G S R S E T R I P Q C N G F G A A F V A I V L A F A I A C I G C L E I F I R Y R I I E G E V G A V P						
<i>C. elegans</i> DMSR-2	CH	P Y Y Y F Y F W I Y T K L Y A I T S V L L H S L S L W L T V I M A H R Y L I V K N S N G A Q S N - I S W N Y Y K I T L L G I G A T G I S L I G S T P N T L R Y E I Q D N G L V G A E						
<i>S. ratti</i> DMSR-2	CN	P I Y Y T Y G W V F T L V Y A L L S V F V H S A S L W L T V N M A V L R F F V L R D S S N T G S - - S R W N Y R S A I I S V F L A L L F S L V G A A P N M L R Y E I E D K C P A E V P						
<i>B. xylophilus</i> DMSR-2	CH	P W Y F T F W I V F T Y G Y A V L S V F V H S A S L W L T V N M A V L R Y L V L K S G S S S R N W F R L N T Y K A A S F A V I S A V L L A A V G S A P N M L R Y Q I R N N Q L G V P						
<i>G. pallida</i> DMSR-2	CH	P L Y F T F T W I V F T Y S Y A L F S V L F H S A S L W I T V N M A V L R Y L V L K S S S N S R N W F R L N T Y K A A S F S I V A A I L L A A V G S A P N M L R Y Q I F Y K Q E V P V P						
<i>M. hapla</i> DMSR-2	CH	P L Y F T F T W I V F T Y S Y A L F S V L F H S A S L W I T V N M A V L R Y L V L K S S S N S R N W F R L N T Y K A A S F A I V A A I L L A A V G S A P N M L R Y Q V						
<i>M. incognita</i> DMSR-2	CH	P W Y F T Y F W I V F T Y F Y A I L S V F V H S A S L W L T V N M A V L R Y L V L K R S S S S K I P I V N T F K A A I A I I A A I V I S L L G S L P N M L R Y Q I R D G L V P						
Consensus	CH	P W Y F T Y F W I V F T Y F Y A I L S V F V H S A S L W L T V N M A V L R Y L V L K R S S S S K I P I V N T F K A A I A I I A A I V I S L L G S L P N M L R Y Q I R D G L V P						

T. spiralis DMSR-2 CPPAAVAHLAN-----QTVYEIKPSSWYTAEMIAINLITVGG--LVLKVLPCILLISIFIALLIHLLIDTRRQIRLSKKN-----IATGDRRTALL
T. muris DMSR-2 DGCAGQARDN-----STTYEIDPPRWWTPELAINFWIVG--IMMKVLPCELLTIFIALLIHLLVDTRRQVRLAKTSN-----VATSDRRTALL
B. malayi DMSR-2 AYCTSNQSAHYHYV--NPKVHAYNIAQPAWWTCTRWERFNFWAAG--LVLKLPCLMLTIFMTLLVRMLIEARERRIRLGRGQTG----DKSQAERTTTML
W. bancrofti DMSR-2 TYCTSNQSAHYHYV--NPKVHAYNIAQPAWWTCTRWERFNFWAAG--LVLKLPCLMLTIFMTLLVRMLIEARERRIRLGRGQTG----DKSQAERTTTML
D. immitis DMSR-2 MHCTTNQSAHYHYAD--NPKVHAYNIAQPSWWTCTRWERFNFWAAG--LVLKMLPCMLTIFMTLLVRMLIEARERRVRLGRGQLG----VKSQAERTTTML
O. volvulus DMSR-2 PYCTTNQSAHYHYV--NPKVHAYNIAQPSWWTCTRWERFNFWAAG--LVLKMLPCMLTIFMTLLVRMLIEARERRMRLGRGQTG----VKSQAERTTTML
O. ochengi DMSR-2 PYCTTNQSAHYHYV--NPKVHAYNIAQPSWWTCTRWERFNFWAAG--LVLKMLPCMLTIFMTLLVRMLIEARERRMRLGRGQTG----VKSQAERTTTML
L. loa DMSR-2 AYCTSNQSAHYHYV--NPKVHAYNIAQPSWWTCTRWERFNFWAAG--LVLKLPCLMLTIFMTLLVRMLIEARERRIRLGRGQTG----GKSQAERTTTML
A. suum DMSR-2 SYCTANGSTYAHYYTE--NSKVHAYNIAQPLWNCRWERFNFWAAG--LVLKLPCLMLTIFMTLLVRMLIEARERRIRLGGTAS----GKSQAERTTSMML
A. caninum DMSR-2.1 KICL---SSKYHSSWTESSTLYKYDILQPSWVWCHWERINFWMAA--CVLKLPVCLLTIFMTLLVRMLIEARERRRLRGGVAM----GNLSQAERTTAML
A. caninum DMSR-2.2 -----YAHYYTE--NPKVHAYNIAQPSWWTCTRWERFNFWAAG--LVLKMLPCMLTIFMTLLVRMLIEARERRIRLGRGQTG----VKSQAERTATML
N. brasiliensis DMSR-2 KQCLR--SAKYHSSWLVTDITLYKYDILVQPTWVNCWERINFWMAA--CVLKLPVCLLTIFMTLLVRMLIEARERRSRLGGVPM----GNLSQAERTTAML
H. contortus DMSR-2 GSCL---ETKYHSAWESDITLYRYDILVQPTWVNCWERINFWVA--CVLKLPVCLLTIFMTLLVRMLIEARERRRLRGGVPT----GNLSQAERTTAML
C. elegans DMSR-2 DLCL---EGKYSTDWQPNMDIQFYGLSQPLWVNCWERINFWMAA--LILKLPVCLLTIFMTLLVRMLIEARERRSRLGGMGN----GNLSQAERTTAML
S. ratti DMSR-2 PRCLVKGGKAYHYTTS--QIEAYQVVRPTFVNCNWERLTFWVAG--LLLKLPVCLLTIFMTLLVRMLIEARERRRLRGSRTVLCT--AKTQAERTTAML
B. xylophilus DMSR-2 HHCLKNGSTYAKFYK--EDELNSYTIQOPVFNCSWERFSFWVAGGIMLKLIPCLLTIFMTLLVRMLIEARERRSRLCANNSGSASTGKTQAERTTAML
G. pallida DMSR-2 TFCVEAGAKYAHSYQ--PQGLVHAYTLCQPAWVGCGLERFSFWTAGTIFMTLL-----VVRM
M. hapla DMSR-2 DVCRAVNSKFAISFYDNPDIKVDAYVIVQPSFVWNTWERFSFWVAG--LLLKLPVCLLTIFMTLLVRMLIEAR-----ER
M. incognita DMSR-2 -----

Consensus C N S YAH Y D VHAY IAQPSWW C WERFNFW AG LVLKLPCLLLTIFMTLLVRMLIEARERR RLC G KQAERTT ML

T. spiralis DMSR-2 LLIVFVFWLITQLPQGIITIANAFDQAI FDIYLAGDGFIDLLSLVNSCVSFPAYCIMSQMFHFDFMIVFCGLKRCFKINS-----
T. muris DMSR-2 LLIVFVFWLITQLPQGIIVIANAFDKAIFHAYLTLGDIDWLLSLVNSCVSFPAYCIMSQMFHFDFMIVFGMRR-----
B. malayi DMSR-2 TAIVAVFLVTEL PGGILVFAIGLKPGRIRYAMQYLGDFIDVLSLINSNFNIFLCALMSN--VREFLLTFGSCCPKLSENIGGIGSRALTMTHRITQSQRK-
W. bancrofti DMSR-2 TAIVAVFLVTEL PGGILVFAIGLKPGRIRYAMQYLGDFIDVLSLINSNFNIFLCALMSN--VREFLLTFGSCCPKLSENISGIGSRALTMTHRITQAQRKE
D. immitis DMSR-2 TAIVAVFLVTEL PGGILVFAIGLKPGRIRYAMQYLGDFIDVLSLINSNFNIFLCALMSN--VREFLLTFGSCCPKLSENINGIGPRTLMAHRITLSQRKE
O. volvulus DMSR-2 TAIVAVFLVTEL PGGILVFAIGLKPGRIRYAMQYLGDFIDVLSLINSNFNIFLCALMSN--VREFLLTFGSCCPKLSENISGTGSRTLTMTSRI PQSQRRE
O. ochengi DMSR-2 TAIVAVFLVTEL PGGILVFAIGLKPGRIRYAMQYLGDFIDVLSLINSNFNIFLCALMSN--VREFLLTFGSCCPKLSENISGTGSRTLTMTSRI PQSQRRE
L. loa DMSR-2 TAIVAVFLVTEL PGGILVFAIGLKPGRIRYAMQYLGDFIDVLSLINSNFNIFLCALMSN--VREFLLTFGSCCPKLSENISGIGSRPLTIANRITQSQQKE
A. suum DMSR-2 TAIVAVFLITEL PGGILVFAIGLKPGRIRYAMQYLGDFIDVLSLINSNFNIFLCALMSHVFRREFLLTFGSCCPKSESDVSGTKS---AAIRAIPSKRNGF
A. caninum DMSR-2.1 TGIVAVFLVTEL PGGILGLAAGVNRPRMFIITIP LGNFFDLSLINSANFVLCALMSHVFRREFLQTF SMCCPQSENHSGAPITKPNK--KSLFASLT
A. caninum DMSR-2.2 TAIVAVFLVTEL PGGILVFAIGLKPGRIRYAMQYLGDFIDVLSLINSNFNIFLCALMSN--VREFLLTFGSCCPKLSENISGTGSRTLTMTSRI PQSQRRE
N. brasiliensis DMSR-2 TGIVAVFLITEL PGGVGLAAGVNRPRMFIITNPLGNFFDLSLINSANFVLCALMSHVFRREFLHTF SMCCPQSENHSGAPITKSSNR--TFQFFSSLA
H. contortus DMSR-2 TGIVAVFLITEL PGGILGLAAGVNRPRMFIITVPLGNFFDLSLINSANFVLCALMSHVFRREFLHTF SMCCPQSENHSGAPITKPCNK--TFQFFSAFT
C. elegans DMSR-2 TGIVAVFLITEL PGGVITFAAGANPRMFIITLQMNNVFDLSLINSANFVLCALMSHVFRREFLQTFVCCPQSENHSGAPINKTSNRSILSTFSNIA
S. ratti DMSR-2 TIIVAVFLVTEL PGGIFVFLQGVYATEVIHLYLQGLDFLALFNSSVNFILYTTMSYQFRSQFIEFATYLPKTFERI SGSEINTNVLSSKISRDLGFK
B. xylophilus DMSR-2 TMIVAVFLITEL PGGILVFAIGLKPGRIRYAMQYLGDFIDVLSLINSNFNIFLCALMSN--VREFLLTFGSCCPKLSENISGIGSRPLTIANRITQSQQKE
G. pallida DMSR-2 LVIVAVFLITEL PGGILVFAIGLKPGRIRYAMQYLGDFIDVLSLINSNFNIFLCALMSN--VREFLLTFGSCCPKLSENISGIGSRPLTIANRITQSQQKE
M. hapla DMSR-2 RSLVAVMHTITEL PGGILVFAIGLKPGRIRYAMQYLGDFIDVLSLINSNFNIFLCALMSN--VREFLLTFGSCCPKLSENISGIGSRPLTIANRITQSQQKE
M. incognita DMSR-2 --IVAVFLITEL PGGILVFAIGLKPGRIRYAMQYLGDFIDVLSLINSNFNIFLCALMSN--VREFLLTFGSCCPKLSENISGIGSRPLTIANRITQSQQKE

Consensus TAIVAVFLVTEL PGGILVFAIGLKPGRIRYAMQYLGDFIDVLSLINSNFNIFLCALMSN--VREFLLTFGSCCPKLSENISGIGSRPLTIANRITQSQQKE

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T. spiralis DMSR-2 -----
T. muris DMSR-2 -----
B. malayi DMSR-2 ELMAVKCPDEMN-----
W. bancrofti DMSR-2 LMAVVKCPDEINDNNNT-----
D. immitis DMSR-2 LMTVVKCSDEINDNNNT-----
O. volvulus DMSR-2 IMAVVKCNDEINDNNNT-----
O. ochengi DMSR-2 IMAVVKCNDEINDNNNT-----
L. loa DMSR-2 LMVVVKCPDEINDNNNT-----
A. suum DMSR-2 MPLRSSCQDGTN-----
A. caninum DMSR-2.1 PLRK--AKGFLPVPTNEREDRRTDD-----
A. caninum DMSR-2.2 LLAVVVKGPDEMN-----
N. brasiliensis DMSR-2 PKKAP-KDGFVPVPTN-----
H. contortus DMSR-2 PKKA--KDGFVAVPTN-----
C. elegans DMSR-2 KPKTSKKNGFLPVPTNCPDDKNTEQLAMN---
S. ratti DMSR-2 NNNGNFNTSKVHLLTATTTFQRKDLK GKIDEV
B. xylophilus DMSR-2 TPALPDPQNGARKAQ-----
G. pallida DMSR-2 -----
M. hapla DMSR-2 -----
M. incognita DMSR-2 -----

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Consensus

M

15. DMSR-3 homologues

B. malayi DMSR-3
W. bancrofti DMSR-3
D. immitis DMSR-3
O. volvulus DMSR-3
O. ochengi DMSR-3
L. loa DMSR-3
C. elegans DMSR-3
N. brasiliensis DMSR-3
H. contortus DMSR-3
B. xylophilus DMSR-3

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-----TSEEDALLAVHIKTAIILVLCAGITGHVVISIYILYSMIN-PNNLFMISMSTQVALCANFFYSLLFKYLSDVCCISQLWSYANVSTLL
-----QMSSEDEDEVLAVHIKTIILVLCAGINGHTISYIYLYSMISNNLFLIGMCTQVALCANFFYSLLFKYLSDVLCISQLWSYHAWVSTLL
-----QMSSEDEDELLLTTHIKTAIILALCTAGIAGHVVISIYILYSMIN-SNNLFLISMSTQIALCGNFFYSLLFKYLSDVYCCISQLWSHTWVSTLL
-----QMSSEDEDELLLTTHIKTAIILALCTAGIAGHVVISIYILYSMIN-SNNLFLISMSTQIALCGNFFYSLLFKYLSDVYCCISQLWSHTWVSTLL
-----SSDEDEALSAVHIKTAMILLCTAGIIGHVVISIYVLYSIIN-PNNLFMI
MSSNLTDTTTTVFETFLLEYGRILHPPVLLLCISGALGHMLTITTLSSMLNPTNMFLLISMCSQLALCINFLYSTFFKFMSDLQCQPPFFSYYLATITMH
-----YGRVVHPPVLLVLLCISGSLGHLVSIATLSSMMNPTNAFLISMSSQLALCGNFLYSTFFKQWASDELCSPPFFSYYMAKITMH
-----YGRVVHPPVLLVLLCISGSLGHLVSIATLSSMMNPTNAFLISMSSQLALCANFLYSTFFKQWASDELCPYPPFFSYYMTKITMH
-----ILHEPLAMTLCAGILGHFSFINVLSKMPNPTNLLISMSSQLLLCINFLYSTLYKYGSDELCLSSLWSYAWTGTLI
  
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Consensus SEDE L AVHIKT IILILC AGILGHVISIYIYLSMINPTN LLI MSSTQALCANFFYSLLFKYLSDVLCISQLWSY WVSTLL

B. malayi DMSR-3
W. bancrofti DMSR-3
D. immitis DMSR-3
O. volvulus DMSR-3
O. ochengi DMSR-3
L. loa DMSR-3
C. elegans DMSR-3
N. brasiliensis DMSR-3
H. contortus DMSR-3
B. xylophilus DMSR-3

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V-----QKCLRIIMLNIIGAVLLCIPFFNSEVRKVASHWKCQVSSKSNLSVHEISF
VSVNASVVLYMSGVFHITLSIIRFISLNQL-----
VSVNASVVVHMSGVFHVVTLSIVRFISLNQVFLKIKSSEPWFSY----NKCLRTIVLNIIGAVLLCIPFFNSEVRKVPSSHDECSRRYPYKSNLSAHELSF
VSVNASIVVYMSGVFHVVTLSIVRFISLNQVFLKIKSSEPWFSY----SKCLRTIVLNIISAILLCTPFFNSEVRKVPSSHDECSARYPYKSNLSAHELSF
VSVNASIVVYMSGVFHVVTLSIVRFISLNQVFLKIKSSEPWFSY----SKCLRTIVLNIISAILLCTPFFNSEVRKVPSSHDECSARYPYKSNLSAHELSF
F SVTVSVLVHMSAVFHVVALSLIRFFSLAQISSVNSNVQWFTW----QKSRVAIIMYVSVIFLCIPLHFTSQVTEVSENEGCAERYPALRNKVAYQLSY
VSVTLSVLVHMAGVFHVVALSIIRYCSLSSLANINSSQQWFTYQFQKCRISLTIIFVSAIIGTPL-HFTSEVMVSE-NEGCAARRHPALRNASAFQLQF
VSVTLSVLVHMAGVFHVVALSIIRYFSLSALANIHSSQQWFT--FQKFRISLTIIFVSAIIGTPL-HFTSEVMVSE-NEGCAARRHPALRNATAFQLQF
ISVNVSVLVHMTGVFHVVALSIIRYMSLRQISQTTSHVQWFMNKVSMIYYLFDRLKFLGFINFKMGHTTSHAESNEPDENLVKYPISLVNTVHYLEF
  
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Consensus VSVN SVLVHMSGVFHVV LSIIRFISL QL I SS WFSY K L TIILI IS I LCIP FF S V V E CS RYPAL N SAH LSF

B. malayi DMSR-3
W. bancrofti DMSR-3
D. immitis DMSR-3
O. volvulus DMSR-3
O. ochengi DMSR-3
L. loa DMSR-3
C. elegans DMSR-3
N. brasiliensis DMSR-3
H. contortus DMSR-3
B. xylophilus DMSR-3

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TNLASSTAIGRINFWLLGIICKFIPCIIMVMTVLLVQKLRQIQLLSIRFTSPIREKRRRCITY-----VELPQGIISVLSMAYASFAGSEL
TILASNTVGRINFGLLGTMCKLIPCAIMIVMSVLLIQKLRQIQLLSVRFTSRIREKRRRCITYIILI-IMINFVIIVELPQGIISVLSVKGASFAVSES
TILANNTVGRVNFGLLCTMCKLIPCAIMIVMTVLLIQKLRQIQLLSIRFTSRTRERQLRRITY-----VELPQGIISVLSIKGASFAVSES
TILANNTVGRVNFGLLCTMCKLIPCAIMIVMTVLLIQKLRQIQLLSIRFTSRTRERQLRRITY-----VELPQGIISVLSIKGASFAVSES
TQSIW---LRNINFWLFYLVAKVPVSIILCLMTCLILDQLKKIQVLSARFSSVERDKQHSRTTNMILA-IMILFIIIVELPQGVLAVLSTVT--SVKLIYE
SFPY---LQTLNFWLFNLCSKIIPSV-----
SSFPH---LQTLNFWLFNLCSKIIPSVILCLMTFMILAKLKRQIQLLSIRFTSVERDKQYQRTTKMILVVRVHILFIIIVELPQGLLVAATVT--ELQIIVA
SSNEQ---LQTLNFWLFGVCKLVPCSVLSMMTLLLLRELKLRRELSSRFQNVREDRQYSRTTNMIIV-IMVVFIVVELPQGVLTVAQSIIT-QIPYQDT
  
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Consensus T L L NFWL G MCKLIPC IM VMTVLLI KLR IQLLS RFTS REK R T VELPQGIISVLSI S I E

<i>B. malayi</i>	DMSR-3	LGDLF ILSLLNSCVTFGLFCMSSRI RHA F-----
<i>W. bancrofti</i>	DMSR-3	-----
<i>D. immitis</i>	DMSR-3	LG-----
<i>O. volvulus</i>	DMSR-3	IGDLF IFSLLNSCITFALFCMSSRI RNA F-----
<i>O. ochengi</i>	DMSR-3	IGDLF IFSLLNSCITFALFCMSSRI RNA F-----
<i>L. loa</i>	DMSR-3	-----
<i>C. elegans</i>	DMSR-3	LGDLT LFTLLTSI I IFTLLCSMNGKIRSAFKELSCVRSIGRIFATMCPPSPVAASISGHDALLEHNTIIITNCHIDKSENYAVL
<i>N. brasiliensis</i>	DMSR-3	-----
<i>H. contortus</i>	DMSR-3	LGECLMNGK I R S A FKEAPC F R W L E R-----
<i>B. xylophilus</i>	DMSR-3	LGDLF I SLTLLTSI I I FGLF I MNSRI R D E F M E-----
Consensus		LGDL D SLL S I F L F S M R I R F

16. DMSR-4 homologues

A. suum DMSR-4 -MCDRSARLFDMEDPYTSLFSIKGLQKFSKY^YSSV^HEG^LCMV^LIC^IIFG^IMS^NL^VHIL^VL^TR^AP^LRRC^AV^NCV^LT^AV^AV^CD^VL^TMS^SY^VV^VY^LL^RFR^FF^FAV^SR^G

A. caninum DMSR-4 -----

N. brasiliensis DMSR-4 -MCNEGRSLLDLNDLSLVSFVNRLEQFNKV^YTV^FHR^YACL^VIC^AIG^VIS^NAV^HIL^VL^SRP^RMR^RCA^VNC^VL^TA^VA^FC^DV^FT^MT^SY^IV^VL^FR^RI^YQ^GE^NG

H. contortus DMSR-4 -----RV^YTV^FHR^YACL^VIC^LI^GI^SNA^VHIL^VL^SRP^RMR^RCA^VNC^VL^TA^VA^FC^DV^VT^MT^SY^TV^VL^FR^RI^YQ^GE^YG

C. elegans DMSR-4 MCQDEGGTLFDPQDPVAVSGLIDALEQFQS^FY^TY^FHR^YACL^FIC^IV^GMF^SNA^LH^IAV^LS^RP^RMR^RCA^VNS^VL^TA^VA^FC^DV^IT^MT^SY^SI^YL^MR^FR^FY^ET^DH^G

B. xylophilus DMSR-4 -----Y^NA^LHP^LIC^LF^IC^PL^GI^LAN^LV^HIL^VL^TRR^RMR^RCA^VNS^VL^IG^IA^IC^DV^IT^MT^SY^FI^YI^VR^FE^FA^KGL^TK

M. hapla DMSR-4 -----L^FD^RN^ST^TQ^LA^VI^QS^LS^KI^AG^IN^LF^VH^PFL^CL^LI^CP^LG^VL^AN^FV^HIL^VL^TR^RK^MR^RC^AI^NN^CL^IG^IA^VC^DV^FT^MT^SY^FI^YI^VR^FE^IW^TR^IS

M. incognita DMSR-4 -----M^AL^DN^TG^LY^NL^FV^HP^FFL^CL^LI^CP^LG^VL^AN^FV^HIL^VL^TR^RK^MR^RC^AI^NN^CL^IG^IA^IC^DI^CT^MT^SY^FV^YI^LR^FE^IW^TR^IT^S

G. pallida DMSR-4 -----L^NN^HV^HA^VY^LCL^LI^CP^LG^IL^AN^LV^HIL^VL^TR^RMR^RCA^VI^NN^CL^MG^IA^IC^DI^FT^MF^IY^LV^YI^LY^FE^IW^AK^IY^Q

Consensus

YY VH YLCLLIC LGILAN VHILVLTR RMRRCAVN VL AIAICDV TMTSY VYILRF IY

A. suum DMSR-4 ---Y^PY^IW^IA^VL^LS^HA^VF^TI^AL^HA^IT^LY^LS^VA^LA^FI^RW^QA^LG^NV^HS⁻P^WL^LS^SA^WK^LF^GV^CT^IV^VS^IL^CI^PT^ML^VH^RI^VK^MP-----L^KI^LP^LV^SE

A. caninum DMSR-4 -----

N. brasiliensis DMSR-4 ---Y^SY^SW^MM^FL^KI^HV^VV^SI^AL^HA^IT^LY^MG^AV^AF^IR^WQ^AL^GN^IH^S-Q^WL^QR^SA^WK^LF^AF^VT^AT^IS^VM^CV^PT^VM^LH^EI^FV^VS-----D^SK^EH^FS^E

H. contortus DMSR-4 ---Y^SY^SW^ML^FL^KI^HV^VV^SI^AL^HA^IT^LY^MG^AA^LA^FI^RW^QA^LG^NI^HS-R^WL^QR^SA^WK^LF^GI^VT^AS^IS^MM^CV^PT^VM^LH^EI^YE^IS-----N^FA^EQ^AS^T

C. elegans DMSR-4 ---Y^SY^IW^LV^LF^LK^FH^VW^SS^MT^LH^AI^TL^YM^GG^AA^LA^FI^RW^QA^LG^NI^HS-K^WL^QR^NS^WQ^LF^GV^VS^VV^LS^IV^CL^PT^LV^LH^KI^YE^IE^SP^EI^ET^ST^VS^EV^LR^LS^G

B. xylophilus DMSR-4 ---F^SY^FW^AV^LE^FH^AT^LS^IC^LH^TI^NL^YL^CV^TM^AF^IR^WK^AM^RT^SK^S-A^VM^KN^TA^WK^IF^CV^LA^LV^VS^VL^CV^PT^FL^VH^EA^HE^VN^LT^VE^NT^YS^FY^TV^DI^SE

M. hapla DMSR-4 -G⁻I^SF^WA^TY^LH^FH^AT^SI^CL^HT^IA^LY^MC^VT^MA^LI^RW^RV^MS^QP^FS^KV^VV^QP^II^SW^KI^FG^LT^IV^VS^AF^CI^PT^YL^VH^DV^IS^F-----G^AN^FS^VD^IS^E

M. incognita DMSR-4 I^KT^IS^YF^WA^TY^LH^FH^AT^SI^CL^HT^IA^LY^MS^VT^MA^LI^RW^RV^MS^QP^FS^KV^VV^QP^IL^SW^KI^FG^SV^TI^VV^SM^LC^IP^TY^LV^HD^VI^NF-----G^AH^FS^VD^IS^E

G. pallida DMSR-4 T^N-I^SF^WA^TY^LH^FH^AT^VS^IC^LH^TI^TL^YT^CV^TM^AL^IR^WR^VM^SQ^PS^YS-L^IV^QP^AT^VW^KI^FA^LV^TL^VC^FF^CV^PT^YL^VH^DV^IV^KF^RY---A^DG^TT^FT^VD^IS^E

Consensus

YSY W YL FHA SI LH ITLYM V LAFIRW AL N HS LQP SAWKIFGVVTVVVSILCVPT LVHDI...I F VDISE

A. suum DMSR-4 P^AT^LI^AK^EL^YT^LD^MV^ED^AC^SL^FQ^FN^LW^IT^AI^FL^KA^VP^CV^LL^LW^FT^FA^LV^SK^LD^TD^IK^RN^DL^YS^KS-F^RK^HM^RK^TV^PD^KT^TY^ML^VI^MI^SV^FL^AT^EL^PQ

A. caninum DMSR-4 -----W^IL^HF^QA^IP^CG^LL^LW^FT^LA^LV^LK^LR^KT^DE^KR^NY^LY^SK^S-F^RK^HI^KK^TT^VP^DR^TT^YM^LI^IM^IL^VV^FL^VT^EL^PQ

N. brasiliensis DMSR-4 P^S-----Y^TL^DF^AN^YS^CG^FY^KF^NL^WM^LA^VM^KA^IP^CA^LL^LW^FT^VA^LV^MK^LR^KT^DE^KR^NY^LY^SK^S-F^RK^HI^KK^TT^VP^DR^TT^YM^LI^IM^IL^VV^FL^VT^EL^PQ

H. contortus DMSR-4 P^S-----Y^TL^DF^SN^YS^CG^FY^KF^NL^WM^LA^VA^MK^AI^PC^AL^LW^FT^VA^LV^MK^LR^KT^DE^KR^NY^LY^SK^S-F^RK^HI^KK^TT^VP^DR^TT^YM^LI^IM^IL^VV^FL^VT^EL^PQ

C. elegans DMSR-4 Q^SI^P-K^EV^RY^SL^NF^ST^YS^CA^FF^KF^NL^WM^LA^IV^LK^AI^PC^AL^LW^FT^IA^LV^VK^LR^QT^DE^KR^NY^LY^SK^S-F^RK^HV^KK^TT^VP^DR^TT^YM^LI^IM^IL^VV^FL^VT^EL^PQ

B. xylophilus DMSR-4 W^AR-----M^N---R^CR^WF^KA^NL^WI^GI^VL^KA^IP^CF^LL^LW^FT^MA^LM^IR^LH^KN^NA^KR^AM^LY^TN^SV^KG^AR^KF^RQ^NY^DR^TT^FT^LI^VM^IT^AF^LV^TE^LP^Q

M. hapla DMSR-4 L^AR-----S^N---N^CR^YF^KL^NL^FI^GI^VL^KA^IP^CF^LL^LW^FT^LA^LM^RR^LR^EN^NA^KR^AL^LK^GH---N^KK^LL^NY^DR^TT^FT^LI^VL^GV^FL^VT^EL^PQ

M. incognita DMSR-4 W^AR-----S^N---N^CR^YF^KL^NL^FI^GI^VL^KA^IP^CF^LL^LW^FT^LA^LM^RR^LR^EN^NA^KR^AQ^LL^KD^Q---N^KK^LL^NY^DR^TT^FT^LI^VL^GV^FL^LT^EL^PQ

G. pallida DMSR-4 W^AR-----T^D---H^CH^YL^KA^NL^FI^GI^VL^KA^IP^CF^LL^LW^FT^MA^LM^IR^LR^EN^NA^KR^AL^LR^DK---C^KK^LQ^NY^DR^TT^FT^LI^VM^IL^GV^FL^LT^EL^PQ

Consensus

A C FFK NLWIIAIVLKAIPC LLLWFTLALVIKLR TD KRN LYSKS FRKHIKKT VPDRTTYMLIIML VFLVTELPQ

A. suum DMSR-4 F^LA^LL^NG^VY^TA^DV^HR^FI^YV^NV^GD^VL^DL^MS^LI^NC^SV^DC^VL^YC^MS^SR^YR^HT^FN^HL^LI^RA^ES^WL^RN^KR^ER^OY^EK^HW^RT^ST^DN^NP^AK^LG^I-----

A. caninum DMSR-4 F^LA^LL^NG^VY^TD^VN^NY^IY^QH^VG^EL^FD^LL^SL^VN^CR-----

N. brasiliensis DMSR-4 FLALLNGVYITDVNNYIYQHVGELFDLLSLVNCVDFVLYCFMSSRYRQTFGHILIRVESWLRNQSSGWKYSKDLTKVAPPTV-----
H. contortus DMSR-4 FLALLNGVYITDVNNYIYQHVGELFDLLSLVNCVDFVLYCFMSSRYRQTFGHILIRVESWLRNQSSGCKYSKEFSKTPPPTI-----
C. elegans DMSR-4 FLALLNGLYTGDVNIYIYKNISELLDFLLSLINCVDVFLYCFMSSRYRQTFGHMLIRVESWLRNHNHGERRLAREIKKKLPAPVGV-----
B. xylophilus DMSR-4 MLTMLNGVYINDVHTVIYMNLANVLDVLSLINCYVGFAYCFMSSRYRQTFMMML-----
M. hapla DMSR-4 VLTLLNGVFINDVHTVFYMNLANLLDLSLINCYVGFAYCFMCTKYQOTFIMMIIITWLE-----
M. incognita DMSR-4 VLTLLNGVFINDVHTVFYMNLANLLDLSLINCYVGFAYCFMCTKYQOTFVLMIFNCISLTFKCFGVKRNTVITNQERRKRASRKQSAHKRSLVRSSYN
G. pallida DMSR-4 ILLTLLNGLYINDVHSVYMNLANLLDLSLINCYVGFAYCFMCTKYRQTFGLMILTSLDSYRKLVCHEKYGQQGQKHRRSHRHHRRNSQNE--LLRRPEN

Consensus FLALLNGVYIT DVH YIYMNLAELLDLLSLINC V FV YCFM SKYRQTF MII S LR K

A. suum DMSR-4 -----
A. caninum DMSR-4 -----
N. brasiliensis DMSR-4 -----
H. contortus DMSR-4 -----
C. elegans DMSR-4 -----
B. xylophilus DMSR-4 -----
M. hapla DMSR-4 -----
M. incognita DMSR-4 YSKTDCEMPQRH
G. pallida DMSR-4 -----

Consensus

17. DMSR-5 homologues

A. suum DMSR-5 DDFKNCILMMSWCDDEAYLFDLNDN-TTQLFLYRLHFLSSVYTFHRYFCALICFCGVTNVLVHIAVLRKQMRCAFVNSILS¹MAICDVIIMS²FVYI³
N. brasiliensis DMSR-5 -----CQNPPLPFDLKD¹NATAE²FFGLIE³FSRVY⁴THV⁵RYLCLV⁶CVL⁷VGIV⁸LNT⁹LH¹⁰FFVLSRR¹¹PM¹²RY¹³I¹⁴INALLCAM¹⁵AI¹⁶CDAL¹⁷TMS¹⁸YLI¹⁹YI²⁰
H. contortus DMSR-5 -----CQNDPPLFDLED¹NATIQ²FFHELQ³AFSR⁴RY⁵Y⁶GFH⁷RFIC⁸LV⁹CVL¹⁰IG¹¹SLN¹²ILH¹³FFVLSRR¹⁴PM¹⁵RY¹⁶I¹⁷INALLCAM¹⁸AV¹⁹CDAL²⁰TMS²¹YLI²²YI²³
C. elegans DMSR-5 -----MCTQDPLPFDLE¹NSNTI²YFF³QLIA⁴NQV⁵Y⁶TVL⁷HR⁸YLC⁹LV¹⁰CF¹¹FGV¹²LLNS¹³LH¹⁴FFVLSRR¹⁵KAM¹⁶RV¹⁷I¹⁸INALLCAM¹⁹SI²⁰CDI²¹TMT²²SY²³FI²⁴YI²⁵
G. pallida DMSR-5 -----MRLMTCDEELS¹LFDINS²NTT³AV⁴FL⁵EAL⁶WG⁷IST⁸LY⁹NQ¹⁰V¹¹HC¹²WL¹³GL¹⁴FC¹⁵V¹⁶FG¹⁷SLAN¹⁸CV¹⁹H²⁰IF²¹VLSRR²²PAM²³QK²⁴AV²⁵NRL²⁶LLA²⁷IAL²⁸CDI²⁹AT³⁰MAS³¹Y³²TV³³FV³⁴
M. hapla DMSR-5 -----MKLMTCDEELS¹LFDLNS²NTT³IA⁴FL⁵ETL⁶WN⁷IS⁸SL⁹YN¹⁰QL¹¹HC¹²Y¹³VL¹⁴GL¹⁵FC¹⁶V¹⁷FG¹⁸SLAN¹⁹VV²⁰H²¹IF²²VLSRR²³PAM²⁴QK²⁵AV²⁶NRL²⁷LLA²⁸IAL²⁹CDI³⁰CT³¹MF³²SY³³TV³⁴FI³⁵
M. incognita DMSR-5 -----MKLMTCDEELS¹LFDLNS²NTT³IA⁴FL⁵ETL⁶WN⁷IS⁸SL⁹YN¹⁰QL¹¹HC¹²Y¹³VL¹⁴GL¹⁵FC¹⁶V¹⁷FG¹⁸SLAN¹⁹VV²⁰H²¹IF²²VLSRR²³PAM²⁴QK²⁵AV²⁶NRL²⁷LLA²⁸IAL²⁹CDI³⁰CT³¹MF³²SY³³TV³⁴FI³⁵

Consensus M L ICDEDL LFDL NTTI FLE L FS LYT IHRYLCLFICVFGILLNVVHIFVLSRKAMR YAVNALL IMAICDIITM SY VYI

A. suum DMSR-5 RFRVIENED-DT¹LG²Y³Y⁴GW⁵LV⁶FL⁷LI⁸HV⁹VLSIAL¹⁰LHT¹¹IG¹²LY¹³SV¹⁴FMAY¹⁵VR¹⁶VAL¹⁷DRL¹⁸DSK¹⁹W²⁰IR²¹TR²²PV²³GR²⁴IF²⁵FAL²⁶AIT²⁷IFALS²⁸IPT²⁹LIV³⁰HE³¹IV³²PFKH³³FTTV³⁴NE³⁵
N. brasiliensis DMSR-5 RFRIFDNDV-GI¹IG²YS³PWL⁴VFL⁵IA⁶HV⁷TSSIAL⁸LHT⁹CS¹⁰LY¹¹LS¹²VT¹³MAY¹⁴IR¹⁵W¹⁶TAL¹⁷DRL¹⁸DA¹⁹WINNSA²⁰LK²¹Q²²IF²³FLT²⁴AF²⁵SV²⁶TF²⁷SI²⁸PT²⁹LM³⁰VH³¹K³²IV³³SV³⁴NDIL³⁵GT³⁶ND³⁷
H. contortus DMSR-5 RFRIFDNN--GVI¹IG²YS³PWL⁴VFL⁵II⁶HV⁷TSSIAL⁸LHT⁹CS¹⁰LY¹¹LS¹²VT¹³MAY¹⁴IR¹⁵W¹⁶TAL¹⁷DRL¹⁸DA¹⁹WINNSA²⁰VR²¹H²²IF²³FFT²⁴A²⁵SV²⁶AF²⁷SI²⁸PT²⁹LM³⁰VH³¹K³²IV³³VP³⁴SEV³⁵LET³⁶ND³⁷
C. elegans DMSR-5 RFRIFDTPS-TI¹IG²YS³PWL⁴VFL⁵IT⁶HV⁷TSSIAL⁸LHT⁹TS¹⁰LY¹¹LS¹²VI¹³MAY¹⁴IR¹⁵W¹⁶TAL¹⁷DRL¹⁸DA¹⁹WINHGA²⁰LK²¹Q²²IL²³LFT²⁴AL²⁵IV²⁶SV²⁷SI²⁸PT²⁹VM³⁰VH³¹K³²IV³³PV³⁴TEV³⁵LG³⁶M³⁷NE³⁸
G. pallida DMSR-5 RFEFAVDKDEPPI¹GY²DF³FW⁴IT⁵FL⁶LA⁷HV⁸VCSIAL⁹LHT¹⁰IT¹¹LY¹²LV¹³VT¹⁴AF¹⁵IR¹⁶Y¹⁷K¹⁸TK¹⁹VG²⁰SL²¹NH²²ENI²³AC²⁴PL²⁵IT²⁶VA²⁷VL²⁸TV²⁹FI³⁰CI³¹PT³²FL³³I³⁴HS³⁵II³⁶IP³⁷VT³⁸ST³⁹DP⁴⁰IT⁴¹Q⁴²
M. hapla DMSR-5 RFGFAVDPEPPE¹GY²NE³I⁴W⁵IT⁶FL⁷LA⁸HV⁹VCSIAL¹⁰LHT¹¹IT¹²LY¹³LS¹⁴VATA¹⁵AF¹⁶IR¹⁷Y¹⁸K¹⁹TK²⁰Q²¹IG²²SL²³NH²⁴ENI²⁵AL²⁶PV²⁷FL²⁸LV²⁹AA³⁰FT³¹VI³²CI³³PT³⁴FL³⁵I³⁶HS³⁷II³⁸IP³⁹VVA⁴⁰QNA⁴¹K⁴²T⁴³G⁴⁴
M. incognita DMSR-5 RFGFAVNPPEPPE¹GY²NE³I⁴W⁵IT⁶FL⁷LA⁸HV⁹VCSIAL¹⁰LHT¹¹IT¹²LY¹³LS¹⁴VATA¹⁵AF¹⁶IR¹⁷Y¹⁸K¹⁹TK²⁰Q²¹IG²²SL²³NH²⁴ENI²⁵AL²⁶PV²⁷FL²⁸LV²⁹AA³⁰FT³¹II³²CI³³PT³⁴-----

Consensus RFR¹I²_DN³ D IG⁴YS⁵ WLIF⁶LLAH⁷VV SIAL⁸LHT⁹IS¹⁰LY¹¹LS¹²V MAY¹³IR¹⁴W ALDRL¹⁵DSK¹⁶W V IFL¹⁷VA¹⁸ V LSIPT¹⁹LLVH²⁰ IVPV²¹..... ND

A. suum DMSR-5 NYTINLIDNITYYTVGLIPQATD¹NS²CR³LF⁴KANL⁵WL⁶TG⁷IF⁸FK-VIP⁹CV¹⁰LL¹¹FW¹²FT¹³VAL¹⁴MR¹⁵KL¹⁶NET¹⁷SR¹⁸KR¹⁹IF²⁰IL²¹GE-----
N. brasiliensis DMSR-5 TCSNNLYT-----VTLDES¹DFT²GT³LF⁴FRANL⁵WL⁶TG⁷IF⁸FK-AV⁹PC¹⁰V¹¹LL¹²W¹³FT¹⁴IAL¹⁵I¹⁶W¹⁷KL¹⁸CE¹⁹MS²⁰E²¹K²²R²³Q²⁴LR²⁵GS-----
H. contortus DMSR-5 TOYDNL¹YT-----VQLDE²ID³FNG⁴CT⁵LF⁶FRANL⁷WL⁸TG⁹IF¹⁰FK-AL¹¹PC¹²ALL¹³W¹⁴FT¹⁵IAL¹⁶I¹⁷W¹⁸KL¹⁹CE²⁰MS²¹E²²K²³R²⁴Q²⁵LR²⁶GN-----
C. elegans DMSR-5 TDLLEGAKFDGLYT-VQLDET¹KING²CAL³FR⁴VNL⁵WL⁶TG⁷IM⁸FK-AL⁹PC¹⁰L¹¹L¹²W¹³FT¹⁴IAL¹⁵I¹⁶Y¹⁷KL¹⁸V¹⁹Q²⁰MS²¹E²²K²³R²⁴IL²⁵RG²⁶E²⁷K²⁸REN²⁹VE³⁰FQ³¹LL³²ATS³³AT³⁴P³⁵T³⁶T³⁷TR³⁸NE³⁹AS⁴⁰PR⁴¹
G. pallida DMSR-5 HNTILFTV-----GLAE¹FQ²FD³TL⁴FF⁵KL⁶NL⁷WL⁸TG⁹IF¹⁰FK-VIP¹¹CV¹²LL¹³LL¹⁴FT¹⁵LAL¹⁶LY¹⁷E¹⁸L¹⁹KN²⁰RR²¹K²²RL²³MC²⁴SG²⁵TT-----
M. hapla DMSR-5 ENTTL¹Y²TV-----GLAE³FK⁴R⁵LD⁶T⁷CF⁸FF⁹KL¹⁰NL¹¹WM¹²TG¹³IF¹⁴FK-VIP¹⁵CV¹⁶LL¹⁷LL¹⁸FT¹⁹LAL²⁰LY²¹E²²L²³KN²⁴RR²⁵K²⁶RL²⁷GM²⁸CS²⁹GAT-----
M. incognita DMSR-5 -----LAE¹FK²R³LD⁴T⁵CF⁶FF⁷KL⁸NL⁹WM¹⁰TG¹¹IF¹²FK-VIP¹³CV¹⁴LL¹⁵LL¹⁶FT¹⁷LAL¹⁸LY¹⁹E²⁰L²¹KN²²RR²³K²⁴RL²⁵GM²⁶CS²⁷GAT-----

Consensus N LLD TC LFKLNLWLTG¹IF²FK VIP³CV⁴LL⁵W⁶FT⁷IAL⁸IY⁹KL SR¹⁰K¹¹R¹² L GD

A. suum DMSR-5 -----K¹K²K³M⁴AM⁵DK⁶T⁷IL⁸ML⁹II¹⁰ML¹¹F¹²VEL¹³CTE¹⁴LP¹⁵Q¹⁶GAL¹⁷AIL¹⁸NAM¹⁹Y²⁰TS²¹DI²²HAY²³I²⁴Y²⁵M²⁶NL²⁷GEL²⁸LD²⁹LL³⁰SL³¹INC³²N³³V³⁴GF³⁵V³⁶LY³⁷CC³⁸MS³⁹SR⁴⁰Y⁴¹RS⁴²TF⁴³R⁴⁴H⁴⁵T⁴⁶FW⁴⁷LP--ASAAA
N. brasiliensis DMSR-5 -----NN¹CK²TK³LS⁴MD⁵K⁶T⁷IL⁸ML⁹II¹⁰ML¹¹V¹²FL¹³CTE¹⁴LP¹⁵Q¹⁶GL¹⁷AIL¹⁸SAL¹⁹Y²⁰PH²¹V²²HT²³MY²⁴VL²⁵N²⁶GEM²⁷LD²⁸LL²⁹SL³⁰V³¹NCL³²TS³³F³⁴V³⁵LY³⁶CC³⁷MS³⁸ST³⁹Y⁴⁰RAT⁴¹VY⁴²HLL⁴³MP⁴⁴N⁴⁵K⁴⁶TPA⁴⁷K
H. contortus DMSR-5 ---FR¹CK²TK³LS⁴MD⁵K⁶T⁷IL⁸ML⁹II¹⁰ML¹¹V¹²FL¹³CTE¹⁴LP¹⁵Q¹⁶GL¹⁷AIL¹⁸SAM¹⁹Y²⁰PS²¹H²²HT²³MY²⁴V²⁵N²⁶GEM²⁷LD²⁸LL²⁹SL³⁰V³¹NCL³²TS³³F³⁴V³⁵LY³⁶CC³⁷MS³⁸ST³⁹Y⁴⁰RS⁴¹TV⁴²RAL⁴³IM⁴⁴PS⁴⁵R⁴⁶TPA⁴⁷K
C. elegans DMSR-5 LRK¹V²S³Q⁴CSR⁵N⁶VS⁷ID⁸R⁹T¹⁰IL¹¹ML¹²II¹³ML¹⁴V¹⁵FL¹⁶CTE¹⁷MP¹⁸Q¹⁹GL²⁰LS²¹LSA²²I²³Y²⁴PH²⁵V²⁶HT²⁷MY²⁸V²⁹N³⁰GE³¹V³²LD³³ML³⁴SL³⁵INC³⁶LS³⁷F³⁸IV³⁹Y⁴⁰CV⁴¹MS⁴²T⁴³Y⁴⁴RAT⁴⁵V⁴⁶K⁴⁷SV⁴⁸LC⁴⁹R⁵⁰ST⁵¹SR⁵²RT⁵³V⁵⁴F
G. pallida DMSR-5 ---L¹AY²RR³HS⁴AQ⁵SD⁶RT⁷TK⁸IL⁹LL¹⁰LL¹¹VE¹²F¹³ST¹⁴EP¹⁵Q¹⁶GL¹⁷AIL¹⁸IN¹⁹GL²⁰FP²¹ND²²I²³H²⁴Q²⁵F²⁶V²⁷Y²⁸LS²⁹GEL³⁰LD³¹LL³²SL³³INC³⁴NT³⁵CF³⁶IV³⁷MY³⁸C³⁹NS⁴⁰SS⁴¹FL⁴²Y⁴³FK-----
M. hapla DMSR-5 ---L¹AY²RR³HS⁴AQ⁵SD⁶RT⁷TK⁸IL⁹LL¹⁰LL¹¹VE¹²F¹³ST¹⁴EP¹⁵Q¹⁶GL¹⁷AIL¹⁸IN¹⁹GL²⁰FP²¹ND²²I²³H²⁴Q²⁵F²⁶V²⁷Y²⁸LS²⁹GEL³⁰LD³¹LL³²SL³³INC³⁴NT³⁵CF³⁶IV-----
M. incognita DMSR-5 ---L¹AY²RR³HS⁴AQ⁵SD⁶RT⁷TK⁸IL⁹LL¹⁰LL¹¹VE¹²F¹³ST¹⁴EP¹⁵Q¹⁶GL¹⁷AIL¹⁸IN¹⁹GL²⁰FP²¹ND²²I²³H²⁴Q²⁵F²⁶V²⁷Y²⁸LS²⁹GEL³⁰LD³¹LL³²SL³³INC³⁴NT³⁵CF³⁶IV-----

Consensus

LA KR LSIDRTTLMLIIMLVVFLCTELPQGILAILNALYPSDIH FVYLNLGELLDLLSLINCNT FIVYCCMSSTYRAT K

<i>A. suum</i>	DMSR-5	SAISANFRKFSFSV-
<i>N. brasiliensis</i>	DMSR-5	TTLAAQSLKLLIS--
<i>H. contortus</i>	DMSR-5	NALAAQSLKLLMS--
<i>C. elegans</i>	DMSR-5	KNTHLLLDYRIQVS
<i>G. pallida</i>	DMSR-5	-----
<i>M. hapla</i>	DMSR-5	-----
<i>M. incognita</i>	DMSR-5	-----

Consensus

Comment [AM1]:

18. DMSR-6 homologues

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B. malayi DMSR-6 MECPNSPQLFDEKDAIALSILSI VNEFLCL-SYRKLHKYVSMILCVFGLLANCTHIWILTRRPSXRSSVHTVLIICALADSGTMSYAIYLLRYEFCASST
W. bancrofti DMSR-6 MECPNSPQLFDEEDTIALSILSAVNEFLCL-SYRKLHKYVSMILCVFGLLANCTHIWILTRRPSMLRSSVHTVLIICALADSGTMSGYAIYLLRYEFCASST
O. volvulus DMSR-6 MECPNYPQLFDENDITVLSILSTLSELCLRFYRTFHKYVSMILCVFGLLANCTHIWILTRRPSMLRSSVHTVLIICALADIGTMSYAIYLLRYEFTSST
O. ochengi DMSR-6 MECPNYPQLFDENDITVLSILSTLSELCLFYRTFHKYVSMILCVFGLLANCTHIWILTRRPSMLRSSVHTVLIICALADIGTMSYAIYLLRYEFTSST
A. suum DMSR-6 -----FRFYRSFHRYSLLLCFLGLFFNFVHIWVLTTRPRMLQSSVHTVLIICALADIGTMSYLIYLLRYEFSRDEE
A. caninum DMSR-6 -----
N. brasiliensis DMSR-6 ---CKDPQLFDMNNNITHSVLQTLFLFQQ-TYSAVHRVAVLLCLFGLLANSTHIWVLTTRPRMQFSSVHTLLVCIASVDMGTMTSYLIYMTREFEQDHR
H. contortus DMSR-6 ---CKDEPLFDVDNNFTHNIIQTLFLFQQ-TYSSFHRYISVLLCLFGLLANSTHIWVLTTRPRMRFSSVHTVLIICALADIGTMSYLIYMTREFEQEST
C. elegans DMSR-6 -MECNDSPQLFDNNNTYFVIEQFYRFRY-LVSNVHPFLSFLCVLGLAANAHTITVLTTRPRMRHSSVHTVLIICALADIGTMSYLYMY-LSRFEFLSDK
S. ratti DMSR-6 -LNCTSLQLFDYNSDFSTKIIILNIFSEKSYYPQPFHKYISVILCLGIIITNTHIHWLTSRKQMRFSVHIVLFIASADIGTMSYLIYIIR-FEFFN-D
B. xylophilus DMSR-6 -----YGTIHRVVALIICLGLVINCIIHICLTLTRPRNRNSSVHTTLCIALADIGTMSYLVWYLTRFEYFSSST

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Consensus PQLFD IL L F Y HKYVSMILCVFGLLAN IHIWILTRP M SSVHTVLIICALADIGTMTSYLIYLLRYEF SST

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B. malayi DMSR-6 GGYSYGVVLLKLVVLSIALHSISLYLVVFTYIR--ICSVQTRQSOLLETRVAGIISLLISFAIFALCIPTLLAHDIVLQENSPHFIEIHPDLS
W. bancrofti DMSR-6 GGYSYGVVLLKLVVLSIALHSISLYLVVFTYIR--ICSVQTRQSOLLETRVAGIISLLISFAIFALCIPTLLAHDIVLRENSPHFIEIHPDLS
O. volvulus DMSR-6 GGYSYGVVLLKLVVLSIALHSISLYLVVFTYIR--LCSMOTQRSRLLETRVAGIISLLIALVIFALCIPTLLAHDILPQENN-SYLIKSTTLPTNFS
O. ochengi DMSR-6 GGYSYGVVLLKLVVLSIALHSISLYLVVFTYIR--LCSMOTQRSRLLETRVAGIISLLIALVIFALCIPTLLAHDILPQENN-SYLIKSTTLPTNFS
A. suum DMSR-6 NGYPYGVVLFKLVHAVTSIALHVAISLYLVVFMAYIR--LCAIRTTNSRWLQTRLAGFTSLMIALVVFVLCVPTLLAHEIYAQKRTLQYTTVTENEHTSS
A. caninum DMSR-6 -----LISIALHVAISLYLVVLMAYIR--FSAMRLSSSEWLRSESRRLAAGGIASVVFVLCVPTLLAHEIYSRRAISRQG-----
N. brasiliensis DMSR-6 G-YPYVSWALFLKLVVLSIALHVAISLYLVVLMAYIR--YSAMRVATSGWLQPRRSIAAIGIATCVFVLCVPTLLAHEITARRAVSTQGEVSKRYSIGFS
H. contortus DMSR-6 G-YPYGVAMFLKLVVLSIALHVAISLYLVVLMAYIR--YRAMRVVSSSEWLRSESRSMFTAIVIAICVVFVLCVPTLLAHDILARPPDSASGRQTALYSIGFS
C. elegans DMSR-6 EGYSYVWALFLKCHAMLSIALHVAISLYLVVLMAYIR--LSAMKLTTSRWLDHTRALTSALFIALVVFVLCVPTLLAHDIDETTRGVMTN-----
S. ratti DMSR-6 EGYAYKWTVFLHFHASVIALHGLSISLYLVVFMAYIR--CQVMKVKTGQSIWMLPHVALSASVITITLFLSIPTYLAHEIVERTTT-----
B. xylophilus DMSR-6 QGYAYVWALFLQVHAVLSIALHVAISLYLVVLMAYIR--LMAINAGQSKWMPRIALTAALFVITITVFTIPIPTFLAHEVQKNSAA-----

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Consensus GGYSYGV LFLKLVVLSIALHVAISLYLVVFMAYIR L AMRT S WL TRVA L SLLIAL VFILCIPTLLAHDIL S

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B. malayi DMSR-6 ----ESDSSSSNPKYSIGLSKMFVNSDCFLKLNWLWTGIMMKVIPCILLIIFLYCYLIVKLVKAKNKKK---RVALLRERAKDRVYKDHITCMLLLMVSSFL
W. bancrofti DMSR-6 ----ESYSSSNPKYSIGLSKMFVNSDCFLKLNWLWTGIMMKVIPCILLIIFLYCYLIVKLVKAKNKKK---RVALLRERAKDRVYKDRITCMLLLMVSSFL
O. volvulus DMSR-6 ----IPDPNPVTKKYTIGLSKMFVNSDCFLKLNWLWTGIMMKV-----AK-NKKK---RMALLRDRAKEKSYNDRTTYMLLLMVSIFL
O. ochengi DMSR-6 ----IPDPNPVTKKYTIGLSKMFVNSDCFLKLNWLWTGIMMKVTPCMLLCLTYCLIKLVKAKNKKK---RMALLRDRAKEKSCNDRTTYMLLLMVSIFL
A. suum DMSR-6 SEYNQEYYDSVDAKYSIGFSAMVLIQNGCMLLKNLWLWTGIMLKAIVPFLLLIWLTFALIVKLVKAKNKKRMLRLGKMKDKRDKGSLRDRITSMLLMLCVFL
A. caninum DMSR-6 -----
N. brasiliensis DMSR-6 -----D--MVLNESCLLKGNLWLTFIFLKAIPCVLLFWFTIALIGRMKENKEK---RKKLLKSRD-DKGRDVTTYMLVFMVAVFL
H. contortus DMSR-6 -----E--MVLNESCFLKGNLWLTFIFLKAIPCVLLFWFTIALIGRMKENKEK---RKKLLKSRD-DKGRDVTTYMLVFMVAVFL
C. elegans DMSR-6 -----GMYKYKSVGFTIMNQNGCSLMKGNLWLTFIFLKAIPCVLLIIFLIALNLRLENKEK---RKLKKEEAKKRGDFTTYMLLLMVTVFL
S. ratti DMSR-6 -----K---DGIIKYYTIIIRNYRANDCVAFKTYLWVTFILKAVPCFLMFPITLGLLKKLRENQKRNKLSRNRNSSKRNQTPDRITNKMLLLMVTIPL

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B. xylophilus DMSR-6 -----Y N V G F S A L F M E N G C N L L K I N L W L T G I F I K A V P C F L L M C F T A A L I R R L R A N D K K -----R Q L L F H G E S R R S N S D R V T Y M L L L M V F V F L

Consensus V K Y S I G S M F V N C L L K L N L W L T G I M L K A I P C I L L T A L L K L R N K K K R L L L R R K D K D R T T Y M L L L M V S V F L

B. malayi DMSR-6 C T E L P Q G I I A I F N A I Y T A Q F H F Y V Y L T I A D I L D V L S L I N C Y V G F T V Y F C X C S R Y R R T F Y S I I F Y F G F V -----
W. bancrofti DMSR-6 -----F P A I Y T A Q F H F Y V Y L T I A D I L D V L S L I N C H V G F T V Y F C T C S R Y R R T F Y S I L P Y F G F V -----
O. volvulus DMSR-6 C T E L P Q G I I A I F N A I Y T A Q F H L Y I Y L T I A D V L D V L S L I N C Y V G F T V Y F C T C S R Y R R T F Y S V -----
O. ochengi DMSR-6 C T E L P Q G I I A I F N A I Y T A Q F H L Y I Y L T I A D V L D V L S L I N C Y V G F T V Y F C T C S R Y R R T F Y S V -----
A. suum DMSR-6 S T E L P Q G V M A V L N A I Y T K Q F H L F V Y I P L A D V L D L L S L I N C Y V G F T V F C T C T R Y R Q T L L T L F P Q Q C G C V T R S Q T P T H N S M L L Q Q G V P K R Y Y T P Q I D E H L T -----
A. caninum DMSR-6 -----V W F L V Y V C T S R Y R Q T L L S I L P N M P -----
N. brasiliensis DMSR-6 T T E L P Q G V M A V L N A I Y T S Q F H A Y V Y L S I A D V L D L L S L I N C Y V A F L V Y I C T C S R Y R Q T L L S I L P E R P L I L S A A T S H S T M K -----
H. contortus DMSR-6 I T E L P Q G I M A V L N A I Y T S Q F H S Y V Y L S I A D V L D L L S L I N C Y V A F L V Y I C T C S R Y R Q T L L S I L P N M P -----
C. elegans DMSR-6 F T E L P Q G I M A I L N A L F T T Q F H Q M V Y L N I A D V L D L L S L I N C Y V A F L V Y S F T S S R Y R Q T L F S L L P L T K I S Y S G I S T R Q G T L K S H Q H P G A K T L V Q R A N S V E V A -----
S. ratti DMSR-6 I T E L P Q G I C A I L N A L F T Q Q F H E I V Y S N I A D V L D L L S L I N C F V A F I V Y T S T C S R Y R R L L D V L K P L -----
B. xylophilus DMSR-6 V T E L P Q G L F A I L N A M E T Y Q F H R Y V Y V C F A D L D L L S L I N C Y V C F S V Y T A T S T Y R Q T L L M L V E -----

Consensus T E L P Q G I M A I L N A I Y T A Q F H Y V Y L T I A D V L D L L S L I N C Y V G F T V Y C T C S R Y R Q T L L S I L P

B. malayi DMSR-6 -----
W. bancrofti DMSR-6 -----
O. volvulus DMSR-6 -----
O. ochengi DMSR-6 -----
A. suum DMSR-6 S K N I A Q V S I M S T M Q T T V T I N G V T T I L A T E A D A F V -----
A. caninum DMSR-6 -----
N. brasiliensis DMSR-6 -----
H. contortus DMSR-6 -----
C. elegans DMSR-6 S A R S P L V D K A A I T R P N S A Q P T D F -----
S. ratti DMSR-6 -----
B. xylophilus DMSR-6 -----

Consensus

19. DMSR-7 homologues

<i>T. spiralis</i> DMSR-7	-----EIFLNVINQFHQ-QYQAVHGHLCIVLCLFGIVTNINCLVLTFRQMR-SASNMFIAI IALIDMGLMVLVLYVAHFVVQ
<i>T. muris</i> DMSR-7	-----CSFSRSDLLTGNASAVFLDNTNQFHL-RYQHVHGHLCICLFGIVTNIVNFIVLTRSHMR-SASNMFIAI IALIDMSLMVLVLYVYARFVVIE
<i>B. malayi</i> DMSR-7	---MLCVNDTP LF DLSDNATRLFLAAL EA FQR-SYSPVHGFICIVICTFSIGTNLIHILVLTFRPNMRC SAVNCVLT MTVAICDMGTMGSYFIYI CHFV LK
<i>W. bancrofti</i> DMSR-7	---MLCVNDTP LF DLSDNATRLFLAAL EA FQR-TYSPVHGFICIVICTFSIGTNLIHILVLTFRPNMRC SAVNCVLT MTVAICDMGTMGSYFIYI CHFV LK
<i>D. immitis</i> DMSR-7	---MLCVNDTP LF DLSDNATLLFLATL EV FKR-SYSPVHGFICIVICTFSIT TNLVHIL VLTFRPNMRC SGVNCVLT AVATCDI GT LASYFIYI CHFV LK
<i>O. volvulus</i> DMSR-7	-----R-IYSPVQGFICIVICTFSIV TNLVHT VLTFRPNLRC SGVNCIL -----
<i>O. ochengi</i> DMSR-7	-----R-IYSPVQGFICIVICTFSIV TNLVHT VLTFRPNLRC SGVNCIL -----
<i>L. loa</i> DMSR-7	---MLCVNDTP LF DLSNNT TR LLLAAL EA FQR-AYSPVHGFICIVICTFSIGTNLIHVLVLTFRPNMRC SAVNCVLT MTVAICDMGTMASYFIYI CHFV LK
<i>A. suum</i> DMSR-7	---MLCVNDTP LF DFSSNSTR FL QFLAT FQ -AYAPVHGFICVAICTFGI TNLVHVL VLTFRSMRC SAVNCVLT AVAI CDMGTMG SYLVYI CHFV LK
<i>A. caninum</i> DMSR-7	-----
<i>N. brasiliensis</i> DMSR-7	---MECPNDTP LF DFSQNATRN F ISTLSNFRN-LYAPVHGYLCICL CV FGILT TNLVHV VVLSRFV M RNSAVNCVLTAVAI CDI GTMTYLYVYI LHFV FMR
<i>H. contortus</i> DMSR-7	---MECPNDTP LF DFTONATLN F INTLINFQS-LYAPVHGYVCICL CV FGILT TNFVHV VVLTFRV M RNSAVNCVLTAVAI CDI GTMATYLYIYI SHFV LK
<i>C. elegans</i> DMSR-7	---MECPHDAQ LF DPNSN ST QAF LR LKAH FO R-WYQPIHGYV CV LICV FG IF TNFVHV AVLSR F NMNSAVNCILTAVAI CDI GTMASYLYIYI IHFV LK
<i>S. ratti</i> DMSR-7	MARKLCPNDVSL FS GNDF T QLSLHYLDL F YN-FYAKPHGYICLVIC FG LV TNLVHV VLTFRKNL R KSAVNCIMTAVAF CDMGT MFTYLYI NLHV VLGF
<i>B. xylophilus</i> DMSR-7	-----SSQTKILH F PSYFS-FYAPVHGYICV F LCL FG FSS N FIH V IVL T RQSM R GSAVNSIMTAVAI CDMGT MASYLYIYI CHFV LK-
<i>G. pallida</i> DMSR-7	--MHCAN-DPAL FD FDSNSTR AF IQSLV L FOR-AYAPVHGRICV F LCL FG VV TNLH CV V LTRPQMRV S AVNVIMTAVAI CDL GTMGSYLYIYI VHFV FQN
<i>M. hapla</i> DMSR-7	--MECGPDEPT LF NFENNSTR Q FTHSLV L FOR-AYAPVHGRICV F LCL FG VIT TNLH CV V LTRPQMRQ S AVNSIMTAVAI CDL GTMGSYLYIYI WHFV KK-
<i>M. incognita</i> DMSR-7	--MECGPNEAT LF NFENNSTR Q FTHSLV L FORAYAPVHGRICV F LCL FG VIT TNLH CV V LTRPQMRQ S AVNSIMTAVAI CDL GTMGSYLYIYI WHFV KK-
Consensus	C ND LFD NAT FL L FQR YAPVHGFICIVICLFGIVTNLVHVLVLTFRPNMR SAVNCILTAVAI CDMGTMG SYLYIYI HFV L
<i>T. spiralis</i> DMSR-7	Q---CSHFI TY SW TW FL LL HAL FS V L HTI SL WLAAL F ALV R LIV I RR TQ DV S L L TTR F IG K IFCY L ALS V AILS I PHAL T FT V VQ E TPV C KEH---
<i>T. muris</i> DMSR-7	ED--RCQQT M H T Y G W TW FL LL HAL V SV V LHTI SL WLAAL F SLV R LIV I RR KQ DV S L L T T A F IT R LF M Y L ALS V AILS I PHAL T FR V V P EV Y LCKDS---
<i>B. malayi</i> DMSR-7	D---T T ---I Y SYL W M R Y LL CH M VLSIT L H T T S L W LIV A MA F I R Q M T L R N AI L NS N W Q K P Q M A W R V C T L I Y F C V F I L C I P T F L M Y D V V E V --G D W H P-AP
<i>W. bancrofti</i> DMSR-7	D---T T CV L I Y SYL W M R Y LL CH M VLSIT L H T T S L W LIV A MA F I R Q M T L R S A I L N S N W Q K P Q M A W R V C T L I Y F C V F I L C I P T F L V Y D V V E V --G D W H P-AP
<i>D. immitis</i> DMSR-7	N---C S -M P I Y SYL W M R Y LL Y H M V AS I AL H T T S L W L I V A M A F I R Q M T L R N T V L N S S W Q K P K M A W K I C T V I Y I T V F L L C I P T L L M Y D V V E F --G D W R P-AS
<i>O. volvulus</i> DMSR-7	-----
<i>O. ochengi</i> DMSR-7	-----
<i>L. loa</i> DMSR-7	D---T T CM P I Y SYL W M R Y LL S C H M VLSIT L H T T S L W LIV A MA F I R Q M T L R N AI L NS N W Q K P Q M A W K V C L L I Y F C V F L L C I P T L L V Y D V V E I --G D W H P-AP
<i>A. suum</i> DMSR-7	A---S C S P T Y SH L W M Q F LL W H V VLSIAL H T T S L W L AV A MA F I R RM T L K VAR L N S E W OR P Q F A W R V C M G V Y A V F V L C I P T L L V H D I E Y T Q A E W H P-PP
<i>A. caninum</i> DMSR-7	-----PK F A W K L C I L I Y V C V F I M C I P S V F V H E I S L Y P E G V W Q P-TP
<i>N. brasiliensis</i> DMSR-7	Q---S T C S P T F T H G W M Q F L Q W H V M L S I T L H T T S L W L AV A MA F I R RM T L R VAR L N S T W OR P Q F A W K L C I V I F I C V T L M C T F N M F V H E I A V Y E G A V W E P-ST
<i>H. contortus</i> DMSR-7	Q---S T W S P T F T H G W M Q F L Q W H V M L S I T L H T T S L W L AV A MA F I R RM T L R VAR L N S T W OR P Q F A W K L C I A I Y I I V A V L C V P S L F V H E I A V Y E G I V W E P P H P
<i>C. elegans</i> DMSR-7	N---N S C T P T F T H S W L Q F LL W H V VLSIT L H T T S L W LAV A MA F I R RM T L R V T A L N S W Q R P K F A W K L C I G I Y M V V F V L C I P N M L V H E I A R V E G N D W R P--G
<i>S. ratti</i> DMSR-7	SFSTK C SN K N S Y N W N I F L I Y H V I G S I L L H S T L W LAV A MA F I R R I T L Q T N S F N S S W Q K A K I A R K I C V I F I F I S I L P T I L V H N I V K L N K W Y P K D E G
<i>B. xylophilus</i> DMSR-7	-----G K S T Y L S M S F L L F H M F L S I T L H T T L W LAV A MA F I R RM T L H T T L H S Q W R S R L A T K I S I V I F F V V M L F S L P T L L V H R I V E Y E A D V W R P -KP
<i>G. pallida</i> DMSR-7	TP--N C S N P Q F Y W W M L F L L H I F F S I L L H T A L W LAV V M A L R RM T L H R N T I Y S H W Q R A P L A R F I S W G V L G T V F L L S V P S L L V H E I L E L P H N R W T P -SA
<i>M. hapla</i> DMSR-7	-----SS N T Q T H I W Y Y L L L H I F I S I L L H T A L W LAV L M A F I RR M T L H R N T I Y S K W Q R V P L A R R A S S V I F F I L F L C I P S LAV H Q V I E Y P H A N W Q P -SL
<i>M. incognita</i> DMSR-7	-----SS N T Q T H I W Y Y L L L H I F I S I V L H T A L W LAV L M A F I RR M T L H R N T I Y S K W Q R V A L A R R A S S V I F I L L L C I P S L A V H Q V I K Y P H A N W Q P-SL

Consensus

S YTY WM FLL HMVLSI LHTTSLWLAVAMAFIRRM TLR LNS WQRP LAWKLCI IYI VFILCIPTLLVHDIV G W P

T. spiralis DMSR-7 -----SENASIRYTLMPSS-QLAIAAGDCFLLLKTTFWLNGFPPFKLVPCVILFVSIILSLVKFLSEAQAQKQRIIFGNNKRQQ-----
T. muris DMSR-7 -----LHNTTLRLYTLMPSS-QLAIAIHGFLLMKMTFWLNGFPPFKLIPCVILFISILSLVKFLSEAQAQKFRRTFGNNRRQ-----
B. malayi DMSR-7 HCSHSFP-----PNYTAKYTFHVS-PSAMANGCRFFKWNLWMSGIIFKVVPICILLIYFSSSLMLTLHQTTTRKRKLLIKYNSTK-----
W. bancrofti DMSR-7 QCSHGFP-----PNYTAKYTFHVS-PSAMANGCRFFKWNLWMSGIIFKVVPICILLIYFSSSLMLTLHQTTTRKRKLLIKYNSTK-----
D. immitis DMSR-7 HCAHHP-----TNYTAKDYTFHIS-SSAMANGCRFFKWNLWMSGVIKVPICITLLFYFSSALILKLNRVTKKRKLLIKCNVMT-----
O. volvulus DMSR-7 -----FSSRLIILKLRHTTKKRKLLIKCRAT-----
O. ochengi DMSR-7 -----FSSRLIILKLRHTTKKRKLLIKCRAT-----
L. loa DMSR-7 HCAHDFP-----PNYTAKYTFHIS-SSAMANGCRFFKWNLWMSGIIFKVVPICILLIYFSSSLMLTLHRHTTKKRKLLIKCNSTK-----
A. suum DMSR-7 DCEQYFP-----ANYTAKLYTLHP-ESATANGCRFFKLNLMWMSGVLFKVPICVLLFFLSIGLMMKLNHNSRKRREALLKKNFDS-----
A. caninum DMSR-7 RCSQFP-----ANYSQPIYTFVTS-KEATANNCSLFKLNLMWIGIVFKVI-----
N. brasiliensis DMSR-7 QCAMHFP-----PNYTLIYTFQVSKAETANNCSIFKLNLMWIGLVFKVPICILLMFFSVGLVKNKIRQAENNRKLLTNVSLNLNSTDAGAMS-----
H. contortus DMSR-7 HCALSFP-----PNYTEPIYTFQVSKAETANNCRIFKLNLMWIGLVFKVPICILLMFFSVGLVKNKIRQAENNRKLLTNVSLNLNSTDAGAMS-----
C. elegans DMSR-7 KTCQKFA-----SNYSEPVYTFMVS-HAATINNCRLFKWNLMWIGILFKIIPICILLIFLFGVSKIRDAEKHRKLLTSVPSN-----ASTDSKP-----
S. ratti DMSR-7 KCLNDYGG--NENISFQRYTIDFP-EFVLKDNCRIFKGNLWLSGILNKVIPISLLFFLSFSLMSKLLKIAQEKRRKLLENGHKLSDHN-----
B. xylophilus DMSR-7 SCMEFYP-----ANYTETIYTLAVS-PTAMHNGCRWFKANLWLTGTLFKVPICILLIILSSLLKLNKNAEQKRRKLLLNKGGVGNNTN-----
G. pallida DMSR-7 QCSDIYF-----ANYSERLFTVLIIR-QSALANGCVLFRANLWLTGTLFKVPICVLLITLSCSLMQKLRMAERKQGDLLGNVRRNSAVPCGSSGG-----S
M. hapla DMSR-7 LCPKVISGILSKNHSEPIFTIIR-NIAMANGCWLFRANLWLTGTLFKVPICILLIILSASLQRLRQAEKKRCQLLKLKGLGDSPNGRNSLDNLKQRQTN
M. incognita DMSR-7 LCPKIISGILSKNHSEPIFTIIR-NTAMANGCWLFRANLWLTGTLFKVIPNLLIILSASLQRLRQAEKKRCQLLKLKGLSDSP-----

Consensus

C FP NYT IYT IS AMANGCRLFK NLWMSGIIFKVVPICILL SSSLM KL A KRRR LL N

T. spiralis DMSR-7 -----PVRYISRSSTTKLLVTLISFLITEIPQAI VATISGIFPAETIYAKIYPKVGDLLDLLALINCNANFILLCIMSSQFRTTASMF LPRRFQC-----
T. muris DMSR-7 -----PTRYISRSSTTKLLVTLISFLITEIPQAI VATISGIIYPSDIYAKIYPKLGDLLDLLSLINSNANFILLCIMSSQFRTTASMF LPRPKF---
B. malayi DMSR-7 -----IRRGVTKSDRTSALLLAI VLVFLIAEMPQGI IAIMNAIYTHVHIYIYFNLGDILDLLSLLNSSITFVLYCLMSSRYRDTFWTVVLPKHHFFRE
W. bancrofti DMSR-7 -----IRGATKSDRTSALLLAI VLVFLIAEMPQGI IAIMNAIYTHVHIYIYFNLGDILDLLSLLNSSITFVLYCLMSSRYRDTFWTVVLPKHHFF--
D. immitis DMSR-7 -----TKRSVIKSDRTSHLLLAI VLVFLIAEMPQGI IAIMNAVYTHVHQIYIYFNLGDILDLLSLLNSSITFVLYCLMS-SYRETFWTVVLPKCVFFS
O. volvulus DMSR-7 -----KEMPQGI IAIMNAVYTHVHEYIYFNLGDILDLLSLLNSSITFVLYCLMFSRYRKTFWTVVLPKYLSS
O. ochengi DMSR-7 -----KEMPQGI IAIMNAVYTHVHEYIYFNLGDILDLLSLLNSSITFVLYCLMFSRYRKTFWTVVLPKYLSS
L. loa DMSR-7 -----TRRDVIKSDRTSALLLAI VLVFLIAEMPQGI IAIMNAIYTHVHIYIYFNLGDILDLLSLLNSSITFVLYCLMSSRYRDTFWTVVLPKHLFSE
A. suum DMSR-7 -----TKKHTNVSDRTTAMLCVLI VLFLITELPQGI IAILNAIYTHVMIYIYFNLGDILDLLSLLNSSITFVLYCLMSSRYRDTFWTVVLPKPHVYRY
A. caninum DMSR-7 -----
N. brasiliensis DMSR-7 -----AKKSHKSDRTTAMLVVILAVFLITELPQGI IISILCAIFTADVHKYLYFHLGDILDLLSLLNSSITFVLYCLMSSRYRDTFWLVFLPAGAHPL
H. contortus DMSR-7 -----AKK-SHRSDRTTAMLVVILAVFLITELPQGI IISILCAIFTADVHKYLYFHLGDILDLLSLLNSSITFVLYCLMSSRYRDTFWLVFLPAG--AL
C. elegans DMSR-7 -----LKKKNGTSDRTTAMLVVILAVFLITELPQGI IISILCAIFTADVHRVLYFYHGDVLDLLSLLNSSITFVLYCLMSSRYRDTFWEVILP SWACGL
S. ratti DMSR-7 -----TMKRKYTDKTPMLLAILI VFLMTEVPQGVVMIITAIYINDGFNVLYKLNADILDLLSLLNSSITFVLYCLMSSRYRDTFWVLLPKNFQNI
B. xylophilus DMSR-7 -----KRITSDKTTVMLLAILAVFLITELPQGI IISILCAIFTADVHRVLYFYHGDVLDLLSLLNSSITFVLYCLMSSRYRDTFWVLLPKNFQNI
G. pallida DMSR-7 PAALSGTSLKKINSDRTTAMLVVILAVFLITELPQGI IAILNAIYADVHRVLYYLTGDVLDLLSLLNSSITFVLYCLMSSRYRDTFCSLLI IAGCKR
M. hapla DMSR-7 IGLKKFLKNNKRMNADRTTGMLLAILI VFLMTEVPQGI IAILNAIYADVHRVLYYLTGDVLDLLSLLNSSITFVLYCLMSSRYRDTFCSLFLP IQIC--
M. incognita DMSR-7 -----RMHADRSSGLLAILI VFLMTEVPQGI IAILNAIYADVHRVLYYLTGDVLDLLSLLNSSITFVLYCLMSSRYRDTFCSLFLP IKIC--

Consensus

K SDRTT LLLAIL VFLITELPQGI IAILNAIYTTDVH YIYF LGDILDLLSLLNSSINFLVLYCLMSSRYR TFWTVVLPK

T. spiralis DMSR-7 -----
T. muris DMSR-7 -----
B. malayi DMSR-7 FTRKKTSEMLSS-----EMHSTQKQINK-----
W. bancrofti DMSR-7 Q--KKTSEMLSS-----EMHFTQKQIKQTIPCNNNCETRILK-----
D. immitis DMSR-7 R--KKTSEILLS-----EMHSMQKGMKYTVASSSNYSG-----
O. volvulus DMSR-7 V--KHTVASSN-----YNRTILK-----
O. ochengi DMSR-7 -----
L. loa DMSR-7 FIRKTSRMLPS-----EMRFMQKQVKRTVSSSNYEAKILK-----
A. suum DMSR-7 FCIKKTSLEMISSMPAGTLKPQNRATKILINNNTTRKNSRKSGCNHDNYRAITEESDDYSMPLFPEAHSDDL-----
A. caninum DMSR-7 -----
N. brasiliensis DMSR-7 CVNKQTTTTSNFNFTTPIPIQRKNSNKVRSKEYAPLATEAEEQRDD-----
H. contortus DMSR-7 CINKQTATASNLFNFTQIQQLQRKNSNKVRNKEYAPLATEAEEHRDE-----
C. elegans DMSR-7 WTRRGSPTELSQLQLNNSLRG---RKQSYTPLATEPEPARNEYWRYEASVDNQNSREHQL-----
S. ratti DMSR-7 IINKNGITTLFFFTKEFIPSTSNGNQLLKMKSTSLQNNINEELNFLNKKKDIINNKNDKQSVSIKKIGTSQYRGMKKLKN SIGEKNCFFVYEDKNQDITNVC-----
B. xylophilus DMSR-7 -----
G. pallida DMSR-7 CVATAHQSLPMVPSFASQADRDNNRIARTVDTGRRR-----
M. hapla DMSR-7 -----
M. incognita DMSR-7 -----

Consensus

K

T. spiralis DMSR-7 -----
T. muris DMSR-7 -----
B. malayi DMSR-7 -----
W. bancrofti DMSR-7 -----
D. immitis DMSR-7 -----
O. volvulus DMSR-7 -----
O. ochengi DMSR-7 -----
L. loa DMSR-7 -----
A. suum DMSR-7 -----
A. caninum DMSR-7 -----
N. brasiliensis DMSR-7 -----
H. contortus DMSR-7 -----
C. elegans DMSR-7 -----
S. ratti DMSR-7 DTNSIFEDNKEEYSIAKIEGDIQI-----
B. xylophilus DMSR-7 -----
G. pallida DMSR-7 -----
M. hapla DMSR-7 -----
M. incognita DMSR-7 -----

Consensus

20. DMSR-8 homologues

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T. muris DMSR-8 -----VDHFQG-AYQRIHPYLSSTVCSLGIVLNVLNIVILTRSRMKLCPTNVILTAISICDLFCVMTTYLMTQAEITGFHA--
T. spiralis DMSR-8 -----CNRVDFFSQSGYNRVHPYLSSTVCSLGMIFNLVNIIVILTRTRMKLCPTNVILTAISICDFCVMTTYLMTSLSQITNFHQ--
B. malayi DMSR-8 -MNGGACEIGSVPFQNAATWLFATLSNFHVTYGVHPHYIYAVILCFAGTILNVMTIYAVLTRP-SMISPVNVLLCSVAICDVLVMSYLIFFVTHFLINAANRC
W. bancrofti DMSR-8 -MNGGACEIGSVPFQNAATWLFATLSNFHVTYGVHPHYIYAVILCFAGTILNVMTIYAVLTRP-SMISPVNVLLCSVAICDVLVMSYLIFFVTHFLINAANRC
D. immitis DMSR-8 -MNGGACEIGSVPFQNAATWLFATLSNFHVTYGLIHPYIYAVILCFAGTILNVMTIYAVLTRP-SMISPVNVLLCSVAICDVLVMSYLIFFVTHFLISAANRC
O. volvulus DMSR-8 MNGGGACEIGSVPFQNAATWLFATLSNFHVTYGLIHPYIYAVILCFAGTILNVMTIYAVLTRP-SMISPVNVLLCSVAICDILVMSYLIFFVTHFLINAANRC
O. ochengi DMSR-8 --GGGACEIGSVPFQNAATWLFATLSNFHVTYGLIHPYIYAVILCFAGTILNVMTIYAVLTRP-SMISPVNVLLCSVAICDILVMSYLIFFVTHFLINAANRC
L. loa DMSR-8 -MNGGACEIGSVPFQNAATWLFATLSNFHVTYGVHPHYIYAVILCFAGTILNVMTIYAVLTRP-SMISPVNVLLCSVAICDVLVMSYLIFFVTHFLINAANRC
A. suum DMSR-8 -----IGSVPLPNITWLSAIAQFDSSYGAVHPYIYAVILCFVSGTIMNLTIVIVLTRP-SMISPVNVLLCSVAICDVLVMSYLIFFVSHFLIGAANRC
A. caninum DMSR-8 -----MGALLVRNAEWLADAVAVLHGAYAHHPYMAVALCLAGTAMNAVTVVVLTRP-SMISPVNVLLCSVAICDILVMTSVLVFVYHFLISASFRC
N. brasiliensis DMSR-8 -----FRC
H. contortus DMSR-8 -----MGALPLTDAEWLSDAVSTLHSAVAHLHPYMAVVLCLAGTVMNAVTVVVLTRP-SMISPVNVLLCSVAICDILVMTSVLVFVYHFLISANFRC
C. elegans DMSR-8 -----MGSVNFTGAEWLETAVTNINTAYAHHPYVSVLCLAGTAMNLTIVIVLTRP-SMRSAVNSLLCAIALCDILVMTSVLVFVTHFLIFAGYRC
S. ratti DMSR-8 -MSFDCTCSSNVVVFVENNFQVWKYLYLYSEYHSNVALGICIIIGILLNITVAVLSRP-IMRNSINILCFIACDILVMTSVLVFVTHFLIFAGYRC
B. xylophilus DMSR-8 -----IGSILLPNIITWLTGQVNAFQSSYVEIHQVYATFCLIVGTLNLTIVVVLTRP-SMISPVNVLLCSVAICDILVMTSVLVFVTHFLIFAGYRC
G. pallida DMSR-8 -----IGSILEMPPEEWLFSGAASFQSSYQVHPYIYAVILCFVSGTIMNLTIVIVLTRP-SMRSPVNVLLCSVAICDILVMTSVLVFVTHFLIFAGYRC
M. hapla DMSR-8 -----ICTLEMPPLEWLFATAAFQQNYCQIHPYIYAVILCFIAGTAMNLTIVIVLTRP-SMRSPVNVLLCSVAICDILVMTSVLVFVTHFLIFAGYRC
M. incognita DMSR-8 -----IGTLEMPPLEGLTATAAFQQNYCQIHPYIYAVILCFIAGTAMNLTIVIVLTRP-SMRSPVNVLLCSVAICDILVMTSVLVFVTHFLIFAGYRC
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Consensus

IGSV NA WLF ALA F TYG IHPYIYAVILCIAGTILNVTVVVLTRP SMISPVNVLLCSVAICDILVMTSVLVFVTHFLIFAGYRC

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T. muris DMSR-8 STPTGMFYWAVFVLIHNSASVVLHAG-----
T. spiralis DMSR-8 SSSSCMFYWALFVLFHNSASVVLHATSIWLT-VLLASIRVYSVRRALRRSLW-HCSPRSAAARYSVAIFLIALLDIPMLSFGLIQRWATENATVANSTE
B. malayi DMSR-8 LHTDYSYPWTIFFTLIHAHASVILHSTSIWLT-VLLAQIRVLTIRRSILHPST-TVTIRFTVLLSLATCSIMSLFNLPNFLTFFKIVRTSPELFLPCLVKFS
W. bancrofti DMSR-8 LHTDYSYPWTIFFTLIHAHASVILHSTSIWLT-VLLAQIRVLTIRRSILHPST-TVTIRFTVLLSLATCFIMSLFNLPNFLTFFKIVRTSPELFLPCLVKFS
D. immitis DMSR-8 LHTDYSYLWTFIFFTLIHAHASVILHSTSIWLT-VLLAQIRVLTIRRSILHPST-TVTIRFTVLLSLATCFIMSLFNLPNFLTFFKIVRTSPELFLPCLVKYS
O. volvulus DMSR-8 LHTDYSYPWTIFFTLIHAHASVILHSTSIWLT-VLLAQIRVLTIRRSILHPST-TVTIRFTVLLSLATCFIMSLFNLPNFLTFFKIVRTSPELFLPCLVKYS
O. ochengi DMSR-8 LHTDYSYPWTIFFTLIHAHASVILHSTSIWLT-VLLAQIRVLTIRRSILHPST-TVTIRFTVLLSLATCFIMSLFNLPNFLTFFKIVRTSPELFLPCLVKYS
L. loa DMSR-8 LHTDYSYPWTIFFTLIHAHASVILHSTSIWLT-VLLAQIRVLTIRRSILHPST-TVTIRFTVLLSLATCFIMSLFNLPNFLTFFKIVRTSPELFLPCLVKYS
A. suum DMSR-8 DYNDYSFAWAVFTLFAHASVIFHSTSIWLT-VSLAQIRVLTISRATSGPTT-TITTRFTVALSFIITCLIMASVNIIPNFLTFFIEMAASTFLS-----
A. caninum DMSR-8 DPDDYDRMWAYFLFAHSQSTVILHATSIWLT-VLLAK-----
N. brasiliensis DMSR-8 DPDDYDQIWAYFLFAHSQSTVIFHATSIWLT-VVQVA-----
H. contortus DMSR-8 DPEDYDKKWAYFLFAHSQSTVILHATSIWLT-VLLAQIRVYTIKRATAGPSE-AISARSTGGIALLILCVVALVNIIPNFLTFFIEMADELWLPCL----
C. elegans DMSR-8 DPTDYNIYWAYFLYHSQATVIFHATSIWLT-VLLAQIRVFSIRRAATSVAGE-SVINQMTCLIAVTFIVVCLLNVPNMLTFFIETPASLWLQCKANET
S. ratti DMSR-8 SIDSYSYGAWAFMMFHANSSVIVHSTSLWLT-VSLAQIRLLTIRKATVGPTG-MFSEKATVYLSIATFFTFMIVNIIPNLSMEIFSTDSIQFFKPFGLT
B. xylophilus DMSR-8 QLQDYSYGAWAFMMFHANSSVIVHSTSLWLT-VSLAQIRVLTIRRAATAGPTT-QITFERFSIILAIIVLILMAAVNLPNFLTFFIEMADELWLPCL----
G. pallida DMSR-8 EPDYSYGAWAFMMFHANSSVIVHSTSLWLT-VSLAQIRVLTIRRAATAGPTT-PLITERFTVLLAVLMLCAMTIVNIIPNFLTFFIEMADELWLPCL----
M. hapla DMSR-8 EPDYSYGAWAFMMFHANSSVIVHSTSLWLT-VVMAQLRVLTIRRAATAGPTT-PLITERFTALIALLLTIVS-----LN-----
M. incognita DMSR-8 EPDYSYGAWAFMMFHANSSVIVHSTSLWLT-VVMAQLRVLTIRRAATAGPTT-PLITERFTALIALLLTIVS-----LN-----
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Consensus

TDYSY WAIFML HAHAVILHATSIWLT VLLAQIRVLTIRRAT PST VT RFTVLLSL T IIMSL NLPNFLTIV IV... FL C

T. muris DMSR-8 -----L L F K V V P C I L Q S L I G M L I Y L L K Q A R F R R K R L S S G A I N R S
T. spiralis DMSR-8 M S S F Y -----V T S I -----S T F A Q K N D R I L L K F A F W C N G V S F K V V P C I F Q S I L I G M L I H L L R K A R F R R K R M S S G A I H R S
B. malayi DMSR-8 E N S S L -----H D K V D D D Y T E Q N S -----D Y S Q Y N D F Y P V Y M L V A S Q G N C L K L K L A F W S N G I L F K V V P C L L L T I S I I V L L K V I A D L S R Q R R -H L A Q L M K R -
W. bancrofti DMSR-8 E N S S L -----Y D K V D D D Y T E Q N S -----D Y S Q Y N D F Y P V Y M L V A S Q G N C L K L K L A F W S N G I L F K V V P C L L L T I S I I V L L K V I A D L S R Q R R -H L A Q L M K R -
D. immitis DMSR-8 K N S S L L S I D N S K L D D E Y V Q N S D Y S Q Y D D D N D D N F Y P V Y M L V A S Q G N C M K L K L A F W S N G I L F K V V P C L L L T I S I I V L L K V I A D L S N Q R R -T L A Q L M K R -
O. volvulus DMSR-8 K N S S L S L S I D N D K F D D D Y S Q N ---L E Y V D D S D D -F Y P V Y M L V A S Q G N C M K L K L A F W S N G I L F K V V P C F L L T V S I I V L L K V I A D L S N Q R R -T L A Q L M K R -
O. ochengi DMSR-8 K N S S L S L S I D N D K F D D D Y S Q N ---L E Y V D D S D D -F Y P V Y M L V A S Q G N C M K L --A F W S N G I L F K V V P C F L L T V S I I V L L K V I A D L S N Q R R -T L A Q L M K R -
L. loa DMSR-8 E N S S S -----Y S K I D D Y S E Q N P -----D Y S Q H D D F Y P V Y M L V A S Q G N C V K L K L A F W S N G I L F K V V P C L L L T V S I I I L L K V I A D L S H Q R R -T L A Q L M K R -
A. suum DMSR-8 -----C L K L A F W S N G M I F K V V P C F L L T I S I A A L L K I I A D V S H R R R -S L A Q V M K K
A. caninum DMSR-8 -----V A F W E N G I L F K V P F A L L T V S I I A L L K I I K D V S V R R K -S L A Q V M K K
N. brasiliensis DMSR-8 -----F W T N G ---L L F K V V P C L L L T I S I I A L L K I I R D V S H R R K -S L A Q V M K K
H. contortus DMSR-8 -----T S A T ---Q E E V A F W T N G I F F K V V P C L L L T V S I I A L L K I I R D V S H R R K -S L A Q V M K K
C. elegans DMSR-8 -A E -----D D M L V Y I V A P S D H C G L N I A F W T N G V L F K V V P C L L L T F S I V A L V S I I R D V G K R R K -Q L A Q V M K K
S. ratti DMSR-8 I T N Y D D K V I Y N F P -----S S E N E T I E N I D K I E S N I K Y L A S Y V R -K N N C I M K I S Y W I N G A I Y K I V P C V L L T I S I V A L L K M I K D V K K R R L -K L A E C T K R -
B. xylophilus DMSR-8 -----F Q M A F W S N G M I F K V V P C L L L T V S I V A L L K I I A D V S N K R K -N L A Q V M K K
G. pallida DMSR-8 -----Q S S P A D M D Y T V R A H D S D C M K L K L A F W S N G M I F K V I P C L L L T L S I W A L L R I I A D V A H K R R -N L A Q V M R K
M. hapla DMSR-8 -----E P I V Y T V R A H E S D C M N L K L A F W T N G I L F K V I P C I L L T L S I A A L L R I I A D V A H K R K -N L A Q V M R K
M. incognita DMSR-8 -----E P I V Y T V R P H E S D C M N L K L A F W T N G I L F K V I P C I L L T L S I A A L L R I I A D V A H K R K -N L A Q V M R K

Consensus

E V Y L A CM LKLA FWSNGILFKVVPCLLLTISIIALLKIIADVS RRK LAQVMKK

T. muris DMSR-8 L R D Y D K S T P M L I A L L A A F L I A E L P Q G I L L G T A L F K D F R T K V ---Y I K S G P F M D L L S L L N -----
T. spiralis DMSR-8 L R D Y D R S T P M L I V L L A A F L I A E L P Q G I L L V G T A I F K D F R T K I ---Y I K S G A F M D L L S L M N S A V T F V I Y T S M S A A F R R L F F A I F I P F F R T S S P Y E P T ----
B. malayi DMSR-8 K V P K D H T P M L V A V L S I F L I T E L P Q G V M N V L T G I F T G D T F H Q -K V Y L P L G D F M D L L S L I N S A V N F L I Y C I M N K R F R V T F L Q L F C G F F T N R K L S R V V E D Y S
W. bancrofti DMSR-8 K V P K D H T P M L V A V L S I F L I T E L P Q G V M N V L T G I F T G D T F H Q -K V Y L P L G D F M D L L S L I N S A V N F L I Y C I M N K R F R V T F L Q L F C G F F I N R K L S R V V E D Y S
D. immitis DMSR-8 K V P K D H T P M L V A V L S I F L I T E L P Q G I M N V L T G I F T G D T F H Q -K V Y L P L G D F M D L L S L I N S A V N F L I Y C I M N K R F R I T F L Q L F C D F C T N Q K L S -I A E D Y S
O. volvulus DMSR-8 K V P K D H T P M L V A V L S I F L I T E L P Q G V M N V L T G I F T G D T F H Q -K V Y L P L G D F M D L L S L I N S A V N F L I Y C I M N K R F R I T F L Q L F C D F C P N R K L S R I V E D Y S
O. ochengi DMSR-8 K V P K D H T P M L V A V L S I F L I T E L P Q G V M N V L T G I F T G D T F H Q -K V Y L P L G D F M D L L S L I N S A V N F L I Y C I M N K R F R I T F L Q L F C D F C P N R K L S R I V E D Y S
L. loa DMSR-8 K V P K D H T P M L V A V L S I F L I T E L P Q G V M N V L T G I F T G D T F H Q -K V Y L P L G D F M D L L S L I N S A V N F L I Y C I M N K R F R I T F L Q L F C D E C A N R K F S R V V E D Y S
A. suum DMSR-8 K M P K D H T P M L V A V L S I F L I A E L P Q G V M S V L T G I Y S R E T F H Q -K I Y L P L G L M D L L S L I N S A V N F L I Y C A M S R K F R I V F L Q L F I K S L P S A F F R ----
A. caninum DMSR-8 R M P R D H T P M L V A V L S I F L I A E L P Q G M L H V C N A I Y S N E T F Y Q -K I Y L P L G L M D L L S L I N S A V N F L I Y C A M S R K F R T V F L Q T F L A C L P D P L Y R K F L Q D W P
N. brasiliensis DMSR-8 R M P R D H T P M L V A V L S I F L I A E L P Q G M L H V C N A I Y S N E T F Y Q -K V -----
H. contortus DMSR-8 R M P R D H T P M L V A V L S I F L I A E L P Q G M L H V C N A I Y S N E T F Y Q -K I Y L P L G L M D L L S L I N S A V N F L I Y C A M S R K F R T V F M Q T F L S C L P D P L Y R K F L K D W P
C. elegans DMSR-8 R M P R D H T P M L V A V L S I F L I A E L P Q G V L H V F N A I F T K E T F Y Q -K I Y I H L G D V M D V L S L I N S A V N F I I Y C A M S R K F R A V F I Q I F L T C L P Q K I I R K Y A M E A F
S. ratti DMSR-8 K I P K D H T P M L A C V L I I F L I T E L P Q G I L L H L L S G I Y H E S F Q D -H I I K F F G D F S D L L S I T N S A T S F L I I Y C T M S R K F R A V F F A F F C D W L P K P I K H H I R E T D R
B. xylophilus DMSR-8 K V P K D H T P M L V A V L S I F L I A E L P Q G I L L V M T G I F S D T F F K K T V I Y Q L G D F M D F L S L A G F F I Y V G M S R K F R S V F F Q L F F S L I H C T P Y R ----
G. pallida DMSR-8 K V P K D H T P M L A A V L L I F L L A E L P Q G I F L V I N G I F S A E S F H K -R V Y L P L G D L M D L L S L I N S A V G F L I Y V G M S R K F R T V F L Q L L F S ----
M. hapla DMSR-8 K V P K D H T P M L A A L L I I F L L A E L P Q G I L L V I N G I F S S E S F H K -R V Y L P L G D L M D L L S L I N S A V G F L I Y V G M S R K F R T V F L Q I L F S F L ----
M. incognita DMSR-8 K V P K D H T P M L A A L L I I F L L A E L P Q G I L L V I N G I F S S E S F H K -R -----V N S A V G F L I Y V G M S R K F R T V F L Q I L F S V L ----

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Consensus      KVPKDHTTPMLVAVLSIFLIAELPQGVL VLTGIFS ETFHQ KVYLPLGDFMDLLSLINSAVNFLIYC MSRKFR VFLQLF F          D
T. muris DMSR-8  -----
T. spiralis DMSR-8 -----
B. malayi DMSR-8  RMDYAYE SPGQRN--RST DVSRTEQLIPTS QHQPSATS VFTSLSVTRE EPLQNYRKF FTGNLLTVEGNHCRRMTIVTGQAIINDNLRCYIIMYTSTISHV
W. bancrofti DMSR-8 RMDYAYE SPGERN--RST DVSRTEQLMPTS QHQPSATS VFTSLSVTRE EPLQNYRKF FTGNLLTVEGNHCRRMAIVAGQESKE-----
D. immitis DMSR-8  RVEYAYE SQRQHN--RSI DISRTEQLM-LT QHRPSAAS VFTNSSTRDE PLKNQKFTGNLLTVDGNQYRRMTILAKQ-----
O. volvulus DMSR-8  RVEYAYE SSRQPN--RSA DISRTEQLM-LT QHRPSAAS VFTNLSSTRE EQLKNQKFTGNLLTVEDNHYRRMTILAKQ-----
O. ochengi DMSR-8  RVEYAYE SSRQPN--RSA DISRTEQ---VT QHRPSAAS VFTNLSSTRE EQLKNQKFTGNLLTVEDNHYRRMTILAKQ-----
L. loa DMSR-8      RMDYAYELPGQRN--RSA DISRTEQLMLTS QHRPSATS VFTSLSVTRE EPSKNHRKF FTGNLLTVEGNQCRRTTIVTKQESKE-----
A. suum DMSR-8      -----SAQR---LRRNYVVENASQLALTS HRPSATS VLVSIG--PRDDRMLYRKYGDNLIT-----
A. caninum DMSR-8  ALAEMEL SRHKPS--GFT DLTKTEQ--LALTS HRVSA TSM LIHAAS--KE--STSKMYTGNLLSVDTPGPRVDFDARPGTDLMARNLEIHEIRLVVDPDT
N. brasiliensis DMSR-8 -----
H. contortus DMSR-8  ALAELMEL SRHKPS--GLT DLTRSEQ--LALTS HRVSA TSM LIHATA--KE--STSKMYTGNLLSMSK----IRHFWENGTNAIE--SSPQRINLIKCE'T
C. elegans DMSR-8  LDVEVSRMRPTAD-----MTKSEQ--LALTS HRVSA SSVLLPISRDPDPRMYSGNLLTADTNGGYSTSPRVSFDIRKESQISSVDFQLVVPNMQQDS
S. ratti DMSR-8    FETKTDAT KIKSSRGNIIES MYDYTQHRLS IASSFAGELFNTIRDDRKMSWLSRKISNIKVKKNDANNLESTIEHKKSNFLTVPSSYLPRISLTIEVD
B. xylophilus DMSR-8 -----
G. pallida DMSR-8 -----
M. hapla DMSR-8 -----
M. incognita DMSR-8 -----

Consensus      S          DISRTEQ      S H SA SV          E          R FTGNL

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21. EGL-6 homologues

A. suum EGL-6 -----FLQVYDQIHIPLSLTICVFGAISNVFNIIVLTRR--MRTPINVLLAGLSFSQW-----
C. elegans EGL-6 MENIEHNSDFSAMNDTLICTYFECYIHMFAMYDEIHIPLSISICIFGAASNVFNIIVLTRKR-MRTPINILLTGLSIAQWLLATNYFLYLLEYYRYQ
A. caninum EGL-6 -----VYSRKT-MRNPINILLCGLSAAQWLLASN-----
B. xylophilus EGL-6 -----YDRIHIPLSLTICVFGSISNIVNILLVLTTRKTMRTIPINIFLTGLSMAQFRLLAL-----
 Consensus F YD IHIPLSITICVFGAISNVFNIIVLTRKK MRTPINILLTGLSIAQWLLASNYFLYLLL

A. suum EGL-6 -----
C. elegans EGL-6 CVQLLWSEAFTRYRFFNVNLTVFHTIAFTTTTIVAVFRYCALKFPFQANRFIYKCPAIAANVILWIIIPFISLPLFISEVKIVARDHVAYDLQCEME
A. caninum EGL-6 -----
B. xylophilus EGL-6 -K-----WPLRANRFLRCNTWALACSLGIWIIIPFLCIPVFLTSYVALVD-----DNRGCNF
 Consensus FPI ANRFIF AIA L IWIIP I IPLF S V IV D

A. suum EGL-6 --MYDLNYSQNAALVKFVFWFMFGIVLKPFG-----
C. elegans EGL-6 GPLYDLSYQFSPLLVSAPVWAFGIVFKLLPSLILSILLIALIRSLKSVERRRKNWKRTQGANICTNSERKAKRKLTRPRTRTMLVIILLLCVMVELPMG
A. caninum EGL-6 -----
B. xylophilus EGL-6 KGMYDLTYSEDSFLVSAPVWFMFGIVLKPFG-----
 Consensus MYDLSYSE A LVSAVFWFMFGIVLKPFG

A. suum EGL-6 ALNLCGTYGETFGIRIYDHLGSMEMLTLLYSSISFVLYCSMSNDFLHTRQSLF-----
C. elegans EGL-6 ILNLCVAIYGEEFCNRYDVPVGNLMEMLTLLYSSVSVLYCTMSNEYLSFRALFFPWTRENSLRGTRRSWNHRHDETKSPRTFLINRTAPSSYVGS
A. caninum EGL-6 -----
B. xylophilus EGL-6 ILNLFTAIYGDKFGVHIYDQLGSMEMLTLLYSSISFVLYCVTSNDFLRTRQLFLNSKKE-----
 Consensus ILNLCVAIYGE FGIRIYD LGSFMEMLTLLYSSISFVLYCSMSNDFL TRALF KK

22. FRPR-3 homologues

A. suum FRPR-3 -----S T I C V V V M I I M C V G V G N S L S L Y V Y W T P T F R K R S I N L L A A L S A S D L F
A. caninum FRPR-3 -----L I A L L S Q I C G A V M I V L C I F C V V G N S L S L Y I Y T R P A F R K R S I N I L L S A L S A T D I S
N. brasiliensis FRPR-3 -----M I L L L S R V L V N V M V L M C F G I I T N F I S F Y I Y T R K T F R K R S I N V L L A A L S M S D I C
H. contortus FRPR-3 -----V L S I I C F V M C I I G V I T N T F S I I I Y T S V N F R K R S I N I L L T G M S A S D L V
C. elegans FRPR-3 M E G E N S I I N L T T I G V E D D V G T S E I I V V G G I S L T E S K S L Q E E D G L E F F S S L S L F F S C I M V C M C L A G A I M N T V S I F I F T R P S F R K R S I N V L L S G L S A S D I V
S. ratti FRPR-3 -----M P P N A S S P E A A E T --F L P S D H H V L L P S D Q L I W A L S L F F S L L M A S L C V V C A V M N S I S I F I Y S R P A F R K R S I N V L L C G L S A S D L A
B. xylophilus FRPR-3 -----M N S E N T N N I T G E Q ---Q Q F I V D N S I P K D L I P S L S M F A V L M A F L C V A G T V T N T L S I I I F A K A S S R R R S I N V L L C G L S A S D I C
G. pallida FRPR-3 -----M N S D N S K N I T E E Q K S N E Q Q F D S I P L L D N Q D F I P S L S L V F A V L M A F L C V A G T V T N T L S I I I F A K A S S R R R S I N V L L C G L S A S D L S
M. hapla FRPR-3
M. incognita FRPR-3

Consensus

L L S V S V L M L C V G V N T L S L Y I Y T R S F R K R S I N V L L G L S A S D L

A. suum FRPR-3 L C L L A I P V F S I T Q I Q S F L P G I S --K H I T G H I L L F A Y P V T L M L Q S I S V W L L V S I T I D R Y L A V C Y P F K V R A Y C T R T R A T I I I L I V F F S I V Y N F V R F W E F T I
A. caninum FRPR-3 V C V L S I P V F S ---S N H I H H L I P V S E K A I A L M F Y A Y P I T V M F O S M S V W L L V S I T V D R Y L A V C H P F E V G S Y S T R A R A L L T V F L I V V F S I A Y N F V R F W E F Q I
N. brasiliensis FRPR-3 V C V L A I P V F A S T Q L Q Q V I P ---P T I T A M I M V Y L Y P V T I M F O S M S V W L L V S I T V D R Y L A V C H P F M V R V Y C T I N R A K I T V V V I T I V I I A F N F V R F W E F D I
H. contortus FRPR-3 V C L L A I P V F I G T E L P T I F P K I E L P K I L A Y C I V Y L Y P I T I M A G C M S V W M L V S I T V D R Y L A V C H P F M V R V Y C T I N R A K I T V V V I T I V I I A F N F V R F W E F D I
C. elegans FRPR-3 L C I L A I P V F C F S Q L Q Q I I P G I S F --T W L A Q I L V Y A Y P V T I M A Q T M S V W M L V S I T V D R Y L A V C H P F L V R V Y C T T R A L L T A V I F V S V G Y N F V R F W E Y T I
S. ratti FRPR-3 L C V L A I P V F S M S P L E Y F M P G I P --P A I T G H L L V F C Y P V T L M A Q T M S V W M L V G I T I D R Y L A V C Y P F S V R I Y C T V R R A Q L T I G A I L I F S V G Y N L I R F W E Y R I
B. xylophilus FRPR-3 L C I L A I P V F S L A Q L Q Q F I P ---P S I A N H L L V F C Y P L C L M A Q T M S V W M L V G I T I D R L A V C Y P F S I R I H C T V K R A R I I V L G T F L F S L F Y N L V R F W E Y R I
G. pallida FRPR-3
M. hapla FRPR-3
M. incognita FRPR-3

Consensus

L C I L A I P V F S T Q L Q L I P L L P L A H L L V F Y P V T L M A Q S M S V W M L V S I T V D R Y L A V C H P F V R I Y C T R A L T V L L I V I F S V A Y N F V R F W E Y I

A. suum FRPR-3 D D S G G --T S I E S I V P L L R G D P L F M L L Y Q N I A T L L I T Q F L P L I V L C F L N L H V ---A R T I L E A G V Q R R ---E L V A S E K --R E H T A K M M L Y V V I V --F
A. caninum FRPR-3 -----L S I V Q P L L R D S P L F L I W Y Q N I A T L L S Q F V L P L L V L C V L N L O V ---A R T I L M A E Q R R ---E L V A S E K --R E H T A K M M I F V V I V --F
N. brasiliensis FRPR-3 V E S Q S --E E S L E A I V Q P L L R D N Q L F M L W Y Q N I A T L L S Q F V L P L L V L C V L N L O V ---A R T I L I A E Q R R ---E L V A S E K --R E H T A K M M I F V V I V --F
H. contortus FRPR-3 P -----E S L E A I V Q P L L R D S A L F M L W Y Q N I A T L L S Q F V L P L L V L C I L N L O V S Q V A R T I L M A T E Q R R ---E L V A S E K --R E H T A K M M I F V V I T V F
C. elegans FRPR-3 N F D V A P E N R I T E D L V V E K L R A N P H F L L W Y Q N I A T L V S Q F A F P L I V L C V L N I O V ---A R T I L E A S E Q R R ---E L V A S V K --R E H S T A K M M I M V V L V --F
S. ratti FRPR-3 A E P -S --E E T G G F A F K L L R A D P I F M L Y Q N I A Y I I S O Y L L P L F V L C I L N L E V ---A K T I L K A T E Q R R ---E L V S V K --T E H Q T A K M M I F V V I V --F
B. xylophilus FRPR-3 S D D P N ---M P E M L I V G L L R E N Q I Y M V L Y Q N I A M L L T Q F V L P L M V L C I L N L O V ---A K T I L E A G E T R R ---E L V A S E K --R E H S T A K M M L F V V I V --F
G. pallida FRPR-3 N P S D V P ---S E P V V G L L R E D Y L Y M L L Y Q N A A T M L S Q F L L P L C V L C A L N F O V ---A S A I L A A V E Q R R E M W A E E L S A E Q --R E H K T A K M M I M V V I V --F
M. hapla FRPR-3 D S N G E -----I V G L L R D D Y L F M L L Y Q N I A T T L S Q F L L P L C V L C P L N L O V ---A R S I L A A R E R R K N M L W T E L S S V F A S S R E Q S T A N I F C F I F L V --F
M. incognita FRPR-3 D S N G E -----I V G L L R D D Y L F M L L Y Q N I A T T L S Q F L L P L C V L C P L N L O V ---A R S I L A A R E R R K N M L W T E L S S V F A S S R E Q S T A A M M I V V V I V --F

Consensus

S L E I V V P L L R D D L F M L L Y Q N I A T L L S Q F L L P L L V L C V L N L O V A R T I L A E Q R R E L V A S E K R E H T A K M M I F V V I V _ F

A. suum FRPR-3 **LFCYALSMILNLAEILDEDLFRQPIGYLLNDVNNILVVN**SSSSSFIFYTKYSTR--**FRAQLR**-----
A. caninum FRPR-3 **LVCYTF**SFILNVAEILFSSLEFRHPVGYLLNDINNILVVNTSSPFVYVVKYSTR--**YRNQLRT**MYGIRWFA**SKMKFV**DSKPLRGSERLVPTPN**GKALNSY**
N. brasiliensis FRPR-3 **LVCYTF**SFILNVAEILFSSLEFRHPVGYLLNDINNILVVNTSSPFMFYVVKYSTR--**YRNQLRT**IYGIRWVA**AWMKFD**-----
H. contortus FRPR-3 **LVCYTF**SFILNVAEILFSALFRHPVGYLLNDINNILVVNTSSPFVYVVKYSTR**SR**YRNQLRTIYGIRW**AAARFKFYDRK**-----
C. elegans FRPR-3 **LVCYIF**SFILNWEILDKEITGGDIGWFMNDINNVLVVNSTSAIVFYVVKYSTR--**FRNQART**IPGIRWY**ASMSKFN**VYDTEATSNRTMVTRYKESMISI
S. ratti FRPR-3 **LFCYTF**GFILNLEHLIYREIFD**TTIGYMLND**INNILVVFNSSSNFIFYVVKYSTR-----
B. xylophilus FRPR-3 **LFCYML**SFCLNVLEIFNPDLFKNHIG**ELLNDV**NNILVVN**SSSSSFIFYV**KYSSR--**YRAQLRT**MPVIA**FAARCCF**ENRNTN**FSDKSGER**SENYMTLTGY
G. pallida FRPR-3 **LFCYSL**SFCLNVLEILPDLFRSQVGYLLNDVNNILVLN**SSSSSFIFY**AQFSSR--**YRAQLMYL**LRQFRCVDLLFRW**IYGKKPV**YEGSPSGAL**SVGALL**
M. hapla FRPR-3 **VFCYFL**SLCLNVLEM**FMPRLFR**STG**ELLNDV**NNILVLIN**SASSALFY**PSMNKD--CALE-----
M. incognita FRPR-3 **VFCYFL**SLCLNVLEM**FIPRLFR**SSTG**ELLNDI**NNILVLIN**SASSALFY**ARFSSR--**YRAHLI**SLLRNFKFLDCLLPPPKV**SSFGGAET**PSCVFSGIGLRQ

Consensus LFCYTLSFILNVLEIL DLFR PIGYLLNDINNILVVN**SSSSSFIFYV**KYSTR YR QLRTL I W AA F

A. suum FRPR-3 -----
A. caninum FRPR-3 TSIKTAFTDKQKNRR-----
N. brasiliensis FRPR-3 -----
H. contortus FRPR-3 -----
C. elegans FRPR-3 RGTSTR**LSSSHN**LLYKPSYSKPCDI-----
S. ratti FRPR-3 -----
B. xylophilus FRPR-3 SSRQTVYTSATALDNSQVDTSLKPPV**RKF**-----
G. pallida FRPR-3 G-----KQRLSTTVLSEWSHRT**PSPFLL**-----
M. hapla FRPR-3 -----
M. incognita FRPR-3 QNSYNINRQMSSTFLTVASCN**NNNN**NDYGGGGVTKQQQ**KRLRANSAN**PCPL

Consensus

14. FRPR-18 homologues

T. spiralis FRPR-18 -----MDILLIIGLAAADNALLSGT PVYSVIALYTR-PSEQLMKMNHITVTL YPISW
T. muris FRPR-18 -----CSVLMIIIVAVVGLIGNTFIQLFWQSSS-PTSM DILLTGLAAAD SALLSGT PVFSVIALYTS-PSVQLMKAMNYITVTL YPISW
A. suum FRPR-18 SLRLVENVMDSQHLMA SAILLIVCIGVLGNLVSLFMR SRPHMRTASVNVLLSALSAYDLGLL VLSIPV FVVGLDPWQEDISAQYK YAYMLK FV YPVNL
N. brasiliensis FRPR-18 -----MDSQQWMA CAIISLVIVGCFGNSLSLLF SRPHMRCFSV SIR-----SSQQ-----SAVTY LAYVLK WVPVNL
H. contortus FRPR-18 -----MDSQQWMA CAIISLVIVGCFGNSLSLLF SRPHMRCFSV NVLLCALSFDLS LLLLSIPTFVITNLDLW-----SAVTY LAYVLK WVPVNL
C. elegans FRPR-18 -----MESQQLMA CAIIVLVVLCIFGNSLSFLIF SRPHMRSSVNVLLCALSFFDFS LLTSLIPFVITNLDLWANDL-SLSTY MAYILK LLYPTNL
S. ratti FRPR-18 -----SFLVYTRYAT-----SINILLTALSVIDICLLILATPVFVLPFMHIY-FSFIEDTFOAYVLO YIYPLNC
B. xylophilus FRPR-18 -----MEEDNLQOYLASATIMVVVIGCLGNFLSLILFLRHS---SVNTLLAALSVDLCLLLLAVPVFVMPSLDINP-DQTSLYN FLSCVLKV YVPVNL
G. pallida FRPR-18 -----MDTLRHILASSSLAMVIFGCFGNLSLILFLQRKT---SINILLSALAFIDIGLLFAIPVFLPFLDRDG--FITLESVQAIVVKFL YPTNL
M. hapla FRPR-18 -----MELERHILASCTLSLIIIFGCFGNLSALVFLQRTS---SINILLTALSVIDFGLLFAIPVFLPFLQSG--EHFYSEQFOAIVIKFL YPVNL
M. incognita FRPR-18 -----MELERHILASCTLAIIIFGCFGNLSALVFLQRTS---SINILLTALSVIDFGLLFAIPVFLPFLQSG--ELLYSEQFOAIVVKFL YPVNL

Consensus LA A L IVIIGCFGN LS LLF R S SVNILLTALS ID GLLL AIPVFLP L W FLAYVLKFLYPVNL

T. spiralis FRPR-18 MAHCASVWTMVSISVERVYIAVCHPIAARSLSARRSV-AVICVVTTSVLYNFCRFWEYRID-----DHNRV PLLRSNELYQVFVHWMYFFTVF
T. muris FRPR-18 MAHCASVWTMVSISVERVYIAVCHPIAARSLSARRSV-TCLVVIALLSVAVNFCRFWEYKLN-----HRNDV PFLRSNELYQVFVHWMYFFTVF
A. suum FRPR-18 IMQTCSIYIMLLITVERWTA VCRPLQVRVWCSPKSR-IALILVVLCAIILNLRVFEYTFEVTPEGD--TVYARNLRDPDL YYYMIGYFTASYLITHF
N. brasiliensis FRPR-18 IMQTCSVYTMVMITFERWTA VCRPLQVRVWCSPKSR-IAVGCIFVSAVLYNFARFWEYRIHTPDG---AIVERWLRDPAN YGYIIGYFTASYLITHF
H. contortus FRPR-18 TMQTCSVYTMVMITFERWTA VCRPLHVSTWYAPRLSNHDLIVLLSCFLYLFTRFVYKLYKPTVI---VTFSGK YKITWVRGY IGYITLYVVTHF
C. elegans FRPR-18 IMQTCSVYIMVMITFERWTA VCRPLQVRVWCSPKSR-NAILVLIIVSAFLYNFVRFWEYRFVVTESG---ALVWKWLRDPGKIRWY YGYITLYIVTHF
S. ratti FRPR-18 ISQTCSVYVMVFIITIERWTAIAKPLHVRFCITKSAK-MILGTVIIISASINYIPRFWEYED-----HTTKRI LRDITVLYENYMYGYITLYLLTHF
B. xylophilus FRPR-18 MFQTCSIYIMVLIITIERWTA VCKPLQVRIWCTARTSR-MALLCILVFAIAYNVIRFWEYQI---VETEKGLDYTRNLRDINRHPHYVIFYYTGLYLLTHF
G. pallida FRPR-18 MFQTWSIYTIIVLITAERWLAICRPLHVRSLCTPRTAK-WSLIFTALFSAIYNIVRFWEYSRSVWAPDGSLEFERNLRDPTEHFYVILWYYSMLFLVTHF
M. hapla FRPR-18 IFQTCSIYTIIVLITAERWLAICRPLHVRSLCTPRTAK-RSLICIFGFSIAYNIVRFWEYTL---IESDGSLSQRNLRNPNEHPWYMLGYYSLLFLLSHF
M. incognita FRPR-18 IFQTCSIYTIIVLITAERYLAICRPLHVRSLCTPRTAK-RSLFFILGFSIAYNIVRFWEYTL---IESDGSLSQRNLRNPNDHPWYMLGYYSLLFLLSHF

Consensus I QTCSVYTMVLIITIERWLA VCRPL VRSWCTPR SK ALL ILV AILYNIVRFWEY L F R LRDP HP YMIGYITLYLLTHF

T. spiralis FRPR-18 GLPLFTLASVNCIVHTIFARRLRATMSRSQLRQHLAVMMIVLVVIFVSNLAFVNLAE AAG-FFDNMKDDKYFYCLMDVNNLLVEFNSSINLYL
T. muris FRPR-18 GIPLLTLASVNCIVNTIFARRLRSTMSRSQLRQHLAVMMVVLVLFVSNALAFVNLAE AAG-FFDNVMYDRYFYCLTDVNNLLLEFNSSINLFL
A. suum FRPR-18 LIPFGIIVMNGHVCCSMITLRRARLALTRCQREYSTTFMLMMVTVMFALCNTLPFLNLNVE CALPFFSNPE TMYFAYQLNDISNLLVVLNSATTFII
N. brasiliensis FRPR-18 LVPTIMAVLNGSVIVAMWGRMRQMQMTRCQREQSTTVMLLVTVFAVCNTLPFLNLNVE SVFPDFVDPRTTHAYT LNDLSNLLVVLNSATTFIV
H. contortus FRPR-18 LLPFTIMAVLNGSVIVTMWGRMRQMLTRCQREQSTTVMLLVITLFAVCNTLPFLNLNVE SVFPDFVDPRTTHAYT LNDLSNLLVVLNSATTFIV
C. elegans FRPR-18 LVPTSVMAFANGHVIVAMCKLSKTRQMLTRCQREQSTTVMLLVITVFAICNTLPFLNLNVE SIFPTLFQDESTRG LAYW LNDLSNLLVVLNSGTTFII
S. ratti FRPR-18 CIPFAAIFFNMHVIFLILQKKEKRLNLSQRKEIKTTVMILIVTVMFACINVLTFIMNLWENINPTLFSDPKILSMAYMFNDLANFLVILNSASTFII
B. xylophilus FRPR-18 LIPFSVLIIMNGHVCKQITQLRRARLMLTRCQREQSTTVMLLVTVFAVCNTLPFLNLNVE CIKRDLEAEASTAWAYQLNDLSNLLVVLNSSTTWIV
G. pallida FRPR-18 LLPFTIFTLNAVCHRILRLRSVREQLTMK-----MLLVITLAFALCNLPFLNLNVE CIKRDLEAEARTAQMAYLNDLANFLVILNSSTTWIF
M. hapla FRPR-18 LLPFTIISLNGLAHRILHLRSIREQLTNKQLTEHNTAMLLLVTL SFALCNVLPFLNLNVE CVQSDLFINERTASTAFILNDLANFLVVLNSSTTWIY
M. incognita FRPR-18 LLPFTIISLNGLAHRILHLRSIREQLTNKQLREHNTAMLLLVTL SFALCNVLPFLNLNVE CVQSDLFVNES TAATAFILNDLANFLVVLNSSTTWIY

Consensus LLPF I LNG VI ILRLRRIR LTRQQ RE TTVMLLVVTLVFALCNTLPFLNL E I DLF T IAY LNDSLNLVLSSTTFII

T. spiralis FRPR-18 YLIFCRRFRTRFCRMLRCL-----NTASLPLPFAFPPTHADKEPEYKSTGLNLSLQRRNLNNSFDVTSAYYD-----
T. muris FRPR-18 YLIFCRRLRARFWYIFRCS-----KPEGKIPL---FPFRSVERMSSLRSTSAIYRR---RSS-----
A. suum FRPR-18 YFLFSAKYRQTLLEFLRHGCFWDHSRGQCYDNGRSHSLRYVSSTRKHSSANALRSENLLAPAMQKRTERSASVQCATTAPKSLFREASYRTPTPHRCV
N. brasiliensis FRPR-18 YFSFSEKYRQTLIFLIKNGCCASIS----DYNNTAMSRITASMRMNN-----SVDLYRAGSKMSTSSR-----
H. contortus FRPR-18 YFTFSEKYRQTFIFLIKNGCCASIS----DYNTYTAMSRITASMRVNNS----TSDLQRAGSKKSTSR-----
C. elegans FRPR-18 YFTFSEKYRQTLVFLKNGCCATVS----DYNNTAMSRITASMRISSET----GGQIQRQGSKMSNSRSDVLLKPIYMQKRSEFSEYNERTCKHL
S. ratti FRPR-18 YFLFSEKYRLLFDLFR-----YGCTKTKRENYNNTFSRSLRISIR-----
B. xylophilus FRPR-18 YILFSAKYRETAMRLLWRCNTVYEKDVKYNLSRTHSMRASARKGPATSCPTESIRTLSRTNRSNSECDETRKRVSSIIISDKFKRDSKNNKTSNGYR
G. pallida FRPR-18 YTSFSAKFRREGVAALFGLLSQD-----
M. hapla FRPR-18 YAVFSAKYREGVAYLFG-----LRTLDRRRSGLVTNTIEERSNSACSNYNSATGGIQYFEPNKL-----
M. incognita FRPR-18 YAVFSAKYREGVAYLFG-----LRTLDRRRSGLVTNTVEERSNSACSNYNSATGGMQNFEPNKL-----

Consensus Y IFS KYR L FILR AM RS S SAS V

T. spiralis FRPR-18 -----
T. muris FRPR-18 -----
A. suum FRPR-18 GKFREKLN GALPETSRLRLTEQASKSDS-----
N. brasiliensis FRPR-18 -----
H. contortus FRPR-18 -----
C. elegans FRPR-18 APFEEHKLPKLPSEKRRKKLHKMSAVEHRGMPEITITFSEDLPDGEPDSPCQPC
S. ratti FRPR-18 -----
B. xylophilus FRPR-18 VSTQASKKESSSRSLSEVQPSTELLSPPPMTFRAPSPKWSEQPDREPV-----
G. pallida FRPR-18 -----
M. hapla FRPR-18 -----
M. incognita FRPR-18 -----

Consensus