

Title: **Functional analysis and localization of a thyrotropin-releasing hormone-type neuropeptide (EFLa) in hemipteran insects**

Short title: EFLa in Hemiptera

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Thermobia ALG35950 EFLa
 Folsomia XP_021966570 EFLa
 Daphnia pulex EFX70415 EFLa
 Centruroides XP_023218547 fulicin
 Lygus GBHO01039466 EFLa
 Pyrrhocoris EFLa
 Bemisia GBJ01019555 EFLa
 Locusta EFLa
 Lygus GBHO01039465 Proh-4
 Pyrrhocoris Proh-4
 Bemisia XP_018909912 Proh-4
 Locusta Proh-4
 Thermobia GASN02041323 Proh-4
 Folsomia XP_021944824 Proh-4
 Daphnia KZS18932 Proh-4
 Centruroides XP_023242775 Proh-4

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 Centruroides XP_023242775 Proh-4

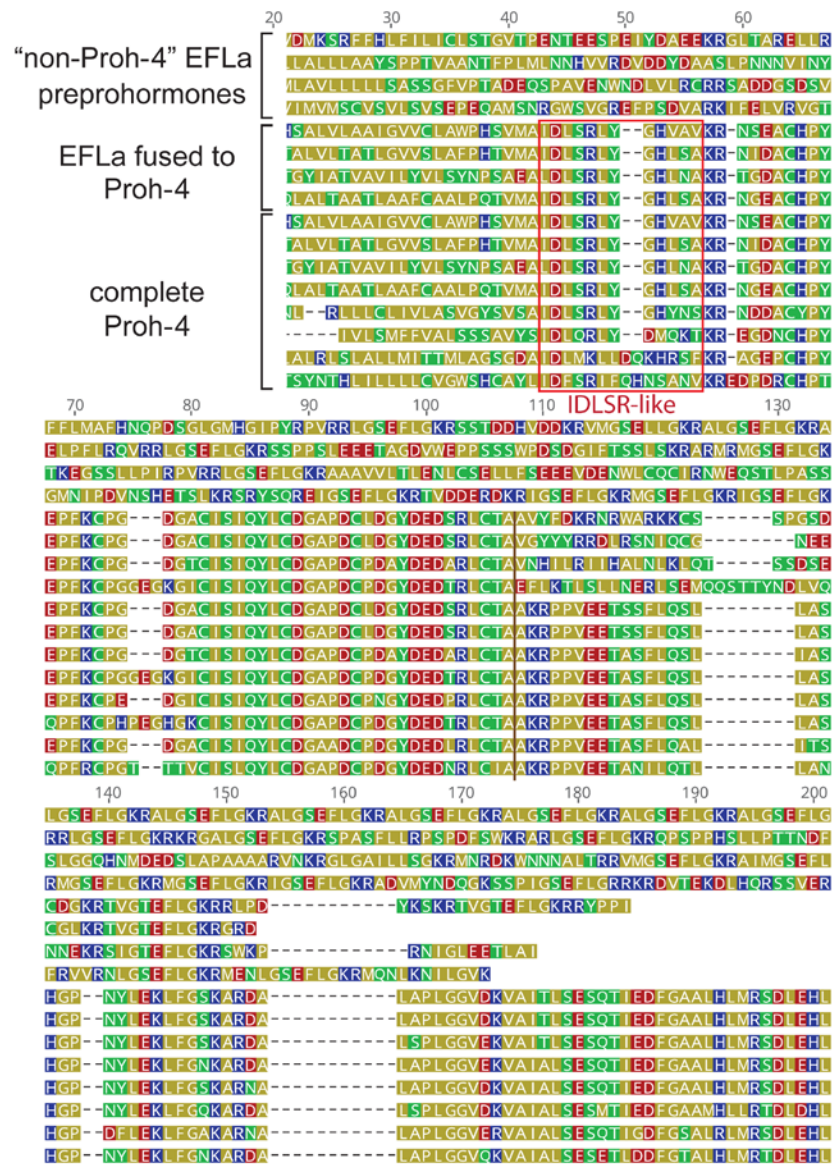


Fig. S1. Protein alignment of Proh-4 preprohormones, EFLa fused to Proh-4 preprohormones and EFLa preprohormones that do not show similarity to Proh-4. The IDLSRF-like motif is highlighted by red box and the brown line indicates the end of identities between Proh-4 and EFLa fused to Proh-4 sequences.

EFLa and Prohormone-4 protein sequences:

>Lygus GBHO01039466 EFLa

MSCSHSALVLAAGVVCCLAWPHSVMAIDL SRLYGHVAVKRNSEACHPYEPFKCPGDGACISIQYLCDGAPD
CLDGYDEDSRLCTAAVYFDKRN R WARKKCSSPGSDCDGKRTVGTEFLGKRRLPDYKSKRTVGTEFLGKR
RYPPI

>Pyrrhocris EFLa

MSSMSPAQTALVLTATLGVVSLAFPHTVMAIDL SRLYGHLSAKRNIDACHPYEPFKCPGDGACISIQYLCD
GAPDCLDGYDEDSRLCTAVGYYYRRDLRSNIQCGNEECGLKRTVGTEFLGKRGRD

>Bemisia GBIJ01019555 EFLa

MTGYIATVAVILYVLSYNPSAEALDLSRLYGHLSAKRTGDACHPYEPFKCPGDGTCISIQYLCDGAPDCPD
AYDEDARLCTAVNHILRIIHALNLKLQTSSDSENNEKRSIGTEFLGKR SWKPRNIGLEETLAI

>Locusta EFLa

MVRACAQLALTAATLAAFCALPQTVMAIDL SRLYGHLSAKRNGEACHPYEPFKCPGGEGKGICISIQYLC
DGAPDCPDGYDEDTLCTAEFLKTL SLLNERLSEMQQSTTYNDLVQFRVVRNLGSEFLGKR MENL GSEFL
GKRMQNLKNILGVK

>Thermobia ALG35950 EFLamide

MVDMKSRFFHLFILICLSTGVTPEENTEE SPEIYDAEEKRGLTARELLRFFLMAFHNQPD SGLGMHGIPYRPV
RRLGSEFLGKR SSTDHVD DKRVMGSELLGKRALGSEFLGKRALGSEFLGKRALGSEFLGKRALGSEFLGK
RALGSEFLGKRALGSEFLGKRALGSEFLGKRALGSEFLGKRSLGSEFLGKR SDEF DKRVMGSEFLGKRALG
SEFLGKRALGSEFLGKR DSESDYLEKKALGSEFLGKRALGSEFLGKRALGSEFLGKR TP EQUEENLENHKEV
VAEPWTFEGSPEHNSTQILLERKKRFA

>Folsomia XP_021966570 EFLa

MSEPRQAQHLTSSLIASALLALLLAAYSPPTVAANTFPLMLNNHVVRD VDDYDAASLPNNNVINYELPFLR
QVRRLGSEFLGKR SPPSLEEETAGDVWEPPSSSWPDS DGIFTSSLSKRARMRMGSEFLGKRRLGSEFLGKR
KRGALGSEFLGKR SPASFLLRSPDFSWKRARLGSEFLGKRQPSPPHSLLPTTNDF

>Daphnia pulex EFX70415 EFLa

MRMEILQHHSACQRMLAVLLLLLSASSGFVPTADEQSPA VENWNDLVLR CRRSADDGSDSVTKEGSSLLPI
RPVRRLGSEFLGKR AA AVLTLENLCSELLFSEEEVDENWLCQ CIRNWEQSTLPASSSLGGQHNMDEDSL A
PAAAARVNKRGLGAILLSGKRMNRDKWNNNALTRRVMGSEFLGKR AIMGSEFLGKR AIMGSEFLGKRGY
NGRSNGLSGPVKI

>Centruroides XP_023218547 fulicin

MSKMLEVITYSRQIVLMAVIMVMSCVSVLSVSEPEQAMSNRGWSV GREFP SDVARKIFELVRVGTGMNIPD
VNSHETSLKRSRY SQREIGSEFLGKR TVDDERDKRIGSEFLGKR MGSEFLGKRIGSEFLGKR MGSEFLGKR
GSEFLGKRIGSEFLGKR ADVMYNDQ GKSSPIGSEFLGRRKRDVTEKDLHQRSSVERV

>Lygus GBHO01039465 Proh-4

MSCSHSALVLAAGVVCCLAWPHSVMAIDL SRLYGHVAVKRNSEACHPYEPFKCPGDGACISIQYLCDGAPD
CLDGYDEDSRLCTAAKRPPVEETSSFLQSL LASHGPNYLEKLFGSKARDALAPLGGVDKVAITLSESQTIED
FGAALHLMRSDLEHLRSVFM AVENGDLGMLKSLGIKDSELGDVKFFLEKLVNTGFLD

>Pyrrhocris apterus Proh-4

MSSMSPAQTALVLTATLGVVSLAFPHTVMAIDL SRLYGHLSAKRNIDACHPYEPFKCPGDGACISIQYLCD
GAPDCLDGYDEDSRLCTAAKRPPVEETSSFLQSL LASHGPNYLEKLFGSKARDALAPLGGVDKVAITLSES
QTIEDFGAALHLMRSDLEHLRSVFM AVENGDLGMLKSLGIKDSELGDVKFFLEKLVNTGFLD

>Bemisia tabaci XP_018909912 Proh-4

MTGYIATVAVILYVLSYNPSAEALDLSRLYGHLSNAKRTGDACHPYEPFKCPGDGTCISIQYLCDGAPDCPD
AYDEDARLCTAAKRPPVEETASFLQSLIASHGPNYLEKLFGSKARDALSPLGGVEKVAITLSESQTIEDFGA
ALHLMRSDLEHLRSVFIAVENGDLGMLKSLGIKSELGDVKFFLEKLVNTGFLD

>Locusta migratoria Proh4

MVRACAQLALTAATLAAFCALPQTVMAIDLSRLYGHLSAKRNGEACHPYEPFKCPGGEGKGICISIQYLC
DGAPDCPDGYDEDTRLCTAAKRPPVEETASFLQSLASHGPNYLEKLFGNKARDALAPLGGVEKVAIALSE
SQTIEDFGAALHLMRSDLEHLRSVFMAVENGDLGMLKSLGIKSELGDVKFFLEKLVNTGFLD

>Thermobia domestica GASN02041323 Proh-4

MAPRSNLRLLLCLIVLASVGYSVSAIDLSRLYGHYNSKRNDACYPYEPFKCPEDGICISIQYLCDGAPDCP
NGYDEDPRLCTAAKRPPVEETASFLQSLASHGPNYLEKLFGSKARNALAPLGGVDKVAIALSESQTIEDFG
AALHLMRSDLEHLRSVFMAVENGDLGMLKSLGIKSELADVKFFLEKLVNTGFLD

>Folsomia candida XP_021944824 Proh-4

MISKMVYCGIVLSMFFVALSSSAVYSIDLQRLYDMQKTKREGDNCHPYQPFKCPHPEGHGKICISIQYLCDG
APDCPDGYDEDTRLCTAAKRPPVEETASFLQSLASHGPNYLEKLFGQKARDALSPLGGVDKVAIALSESM
TIEDFGAAMHLLRTDLHLKSVFVAVENGDLGRLKSLGIKSELGDVRFLEKLVNTGFLD

>Daphnia magna KZS18932 Proh-4

MIAVKLGLIDSTSSSRTHLALRLSLALLMITTLAGSGDAIDLMKLLDQKHSFKRAGEPCHPYEPFKCPG
DGACISIQYLCDGAADCPDGYDEDLRLCTAAKRPPVEETASFLQALITSHGPDFLEKLFGAKARNALAPLG
GVERVAIALSESQTIGDFGSALRLMRSDLEHLRSIFAGIQSGDMTALASLGKDAELGDVKFFLEKLIKTFGL
D

>Centruroides sculpturatus XP_023242775 Proh-4

MAKSTSYNTHLILLLL CVGWSHCAYLIDFSRIFQHNSANVKREDPDRCHPTQPFRCPGTTTVCISLQYLCDG
APDCPDGYDEDNRLCIAAKRPPVEETANILQTLLANHGPNYLEKLFGNKARDALAPLGGVQKVAIALSESE
TLDDFGTALHLMRTDLEHLRSVLTAVESGDL SLLKALGIRDSELADVKVFLDKLVSTGFMD

>Lopidea amorphae GCXF01014748 EFLa_partial

IAALFYEKRNGRWSRQKCNSPGSDCDGKRTVGTEFLGKRGMPDPKSKRTVGTEFLGKRRLPESFPQSLKSS

>Timema genevievae GFPR01023314 EFLa-partial

FLQKEDEQLQDEFSHLIYASNDKQTGSTGLRFKWIQLRSTRDLGSEFLGKRSTKDFTRTLRPSNVFGKKHFA
KALS LYRNISKS NIMFSKILYDL CGLN NFSKSENK LKNIFKTLEVTEK RSLGLEFLGKRKPFK

>Occasjapyx japonicus EFLa [GenBank:GAXJ01010969.1]

MQRGGKISLLLCFVLLCFSAGHARASQEDSAQSQPLSQSQSVSRDEWDAEAGPPDEPQAGEDEEENNEVE
DMVQKRALSARELLHFFLMAMHDQDDGMFSGSSSGIPFRPVRRMGSEFLGKRSVEDPADLHLGDFPNY
MEPEDEGSPSDDVWIPQKRRMGSEFLGKRRMGSEFLGKRRMGSEFLGKRRMGSEFLGKRRMGSEFLGKRR
MGSEFLGKRRMGSEFLGKRRMGSEFLGKRRMGSEFLGKRALGSEFLGKR SIESNSSQERSLNAEPHPAEPV
NQTD AKLYDRRK RSE

>Pedetontus okajimae EFLa

MLLCPRFLCAGPFLLC LCIHSCCSIASQTDNENALVLGRLDPEVYEASKRGPPARDLLRFFLLAFHNNQQDG
TKGSGIPYRPVRRLGSEFLGXRG LGSEFLGKRSQQPYEFLQTYEPEDIENSVDLSNIDRQRKLSPEQYEERE
EESSNIDKRSLHKSEFFGKNYADLDSSGEKRGRLGSEFLGKRSLGSEFLGKRGMGSEFLGKRRMGSEFLGK
RRMGSEFLGKRRMGSEFLGKRMMGSEFLGKRMMGSEFLGKRGLGSEFLGKRALGSIDANHSEPKQNEKYI
KQL

>Panaeus vannamei XP_027222476 EFLa

MVSGWFCLSVLITCCCSPLLGAPPTPTQDETGASSLVKRSAAYPHGTMLRYFLMAMSSSDAPRSPPVLVNR
PIRRLGSEFLGKRSSPPAVSLEESAEDTHACEDEACADEAEVQDDRRKEHLSYTGQYDYDYDNDDDGAND
TAKRDSRIAKPKKRNRIRDRENKDLFSILMSKKMGSEFLGKRMGSEFLGKRMGSEFLGKRMGSEFLGKRA
MGSEFLGKRAMGSEFLGKRVTGSEFLGKRAMGSEFLGKRGMGSEFLGKRAMGFRKFLGKRAMGSEFLGK

RAMGSEFLGKRAMGSEFLGKRAMGSEFLGKRAMGSEFLGKRAMGSEFLGKRAMGSEFLGKRFVPGSLDS
ASVDTKRAVGSEFLG

>Tetrodontophora bielanensis GAXI01153395.1 EFLa

MMMKVECLTSYCPLLILLIVCKTIVVAKTSTGSMIELPSTTTTSQSSSSSLKLLPKDDNHNQKSNDGRSE
MNKIVKYVRAAKYLQSPNGENSMMLIQSRPVARLGSEFLGKRSEMPIHEGKSRIQKRRAMGSEFLGKRR
AMGSEFLGKRNYQIPQIDEYYTISSETGGNGGTGTDWTKPNESQIYIEQGIEPLSYQKNNNNMRRASDYIG
KRKIHDYPTWKQPTLNSRLIQFDKKRRVMGSEFLGKRSSFQGTGKDELNEFGSEKGNF

>Tetranychus urticae XP_015790582 EFLa

MIQSVAKHNSVSPSSSVLLNALIFFMSVSMVHSNSPYKSDVTADEMRLTNSNLITDLVQYLKDASTFNERFR
HSQCCPELGYLNGQESRSASSLPSSSSPSLSALLFSGSSLMPTSSSSSASQPLGLDKRMGSEFLGKRVGSEFL
GKRVGSEFLGKRMGSEFLGRRKRSV

>Ephemera danica AYNC02025439 EFLa

MLLETLEKRSVPTRDLLRYFLLAFHKADGSGSSSSGSSWHNIPYRPVRRLGSEFLGKRSLRTERSADFDNT
GSELFEEPEEKRRMGSEFLGKRAMGSEFLGKRAMGSEFLGKRRMGSEFLGKRIMGSEFLGKRAMGSEFLG
KRAMGSEFLGKRGMGSEFLGKRGMGSEFLGKRGMGSEFLGKRGMGSEFLGKRAMGSEFLGKRRMGSEFL
GKRRMGSEFLGKRRLSSEFLGKRRMGSEFLGKRSMGSEFLGKRDLNENAYENENTNADILEHIFNQSFDNDQ
ENLDPNAAVEEINSAETSDKCKSMSENQDMNSAIADSKLIDHNVAESGESPYSTECEFMHKRDVTDAGLD
ATKDSHRQNNLVRLSGMKPTSSAVHRSKNM

>Orchesella cincta (Collembola) EFLa (from Derst et al., 2016)

...SEFLGKRGMGSEFLGKRGMGSEFLGKRGMGSEFLGKRRMGSEFLGKRRMGSEFLGKRDGDLDSFYFES
SHQDMSPSTNH.....DLVNLVDKRSMGSEFFGKRKPSGDAFSWKRGRLGSEFLGKRSSSEPEQAYPYLQSE
DNDMDLLTSHSGVGKVRDT...

>Homalodisca vitripennis JJNS02005461 isolate HVIT.00 contig_5461

SCGSGDRYGDKRTVGTFLGKR

>Ladona fulva APVN02023242.1 contig_23242, whole genome shotgun

QQREKGLVKWGKDASTAMQPQTAVLYQKKYLGSEFLGKRNLGSEFLGKR

EFLa-Receptor protein sequences

>Ladona fulva (Veenstra and Simo 2020) deduced from (genome KZ308327.1 join (3063995..3064244,
3078489..3078674,3096652..3096904,3101217..3101370,3206328..3206488,3208169..3208364)

MNLTTTNSVVEAWGEGVAGVPRIMSGVPDVRDGFPLPHDPAGAALDGMTPTPTPTFGGESYYNSTLFLE
MDPEYYSHRYRLIGTLFQGVILAVGVAGNALVVAVVARSRSRMSPTNCYLVSIAIADSIIVLIAAVPNEILSY
YLIGNRWVWGEPGALFIFSQNLGINASSLSLVAFTVERYVVGICHPMRAQAMCTVSRAKKITMCVWGFAA
LYSCPWLGLTETKPLKYRGHPEVRFCDFKRPRQEYLAYFFADLVVFYIIPLLSCVLILYIARVLFARRVVK
MLAIVGVGFATLWLPYRGMLVYNSFAILFSREKFMDLWFLMFAKTCVFINSAINPILYNALSYKFRREFQK
TLMCGKKSELWGLAYGRSQPPHSSCTLTRQSTQVQRNAPLKTECK

>Bemisia tabaci XP_018902557 TRHR

MTNSCDYPLNRTDCEDLVEPEFYSYKYRVVGTIFQGAIFLSGVFGNVLVIIIVVKRTQSMHTPTNYLVSIA
VADLTVLVYSVPVAISGLFLVSDTWILGDFGCKLFIFLQNLGINSSSLNLMAFTVERYIAICHPMMAYKMCT
INRAKKIIFGVWIFSIVYCSPWLVLTWTRPLNIRGYPGVGRCDFKLSREKYLLVFFADIMMFYVIPLIVSSILY
VLMGRTLLNTHRPSNSEHRKSSSSSRAQVVKMLAVIVALFATLWLPYRGMLVYNSVASLLNKQKFMDLW
FLLFAKTCVFINSAINPILYNVMSSKFRAAFREFLICSTRSSRNSGQGSSSTFNLSTIRSFSSQNSTAIKRTD
DPQIKDLGF

>Diaphorina citri AWT50634 TRHR

MITLNNVNSINDTFDFLYFDHDLNLTDCMANFTDLIDLQELQCNQTIVKEMFSLEYRIIGTIFQSIIFIVGLLG
NIMVVSVVYKIRSMRTPNCYLVSLSIADLMVLIAAVPNELVSYQEKYTWLWGNYGCKMSVFLQYLGIN

ASSLNLI AFTVERYIAICKPMLAHRIC TLNRARKILYVWIFAVIYSSPWFL TETRQIDPYRETCD FKLPRSY
LVYFFTDIIVFYVIPLALSCLLYILIAHALLSSKSMKHKGRLIHSNVTMVS VTHRHTKNNSSRAQVVKMLAV
VVIVFATLWLPYRLMLVYNSFAAML SQPKFMDLWFIMFAKTCVFINSAINPILYNAMSTKFRRAFSRFLVC
RSPDYNTSTGRLSTVTSMTSLSGRRKVNINGVLVRRNTEYPIRRNTEF

>Ephemera danica (Veenstra and Simo 2020) KZ497744.1 TRHR

MNTTEVCLDCPSPYNLSNSTNSSEIEDYDLPQYYSYRYRIIGTFFQGIVFLVGVLGNVMVVIVVKRTQSMHS
PTNCYL VSLAVADCVVLVSSVPNEILSYYLIGNRWI WGEVGCALFIFCQNLGINASSLSLVAFTVERYVAIC
HPMKAHALCTVNRAKRITLAVWMFAVLYCSPWLGLTITKPLIYRGEPPARCCDFKL PREEYLAYFFADLIV
FYLIPLLLSCVLYS LIARVLFVVKMLAVVAVFATLWLPYRGMLVYNSFAVVPEDKFMDLWFLMFAKTCV
FINSAINPILYNALFKFRRAFQRTL TCKRRGRNECAMSTGMHNTTRRTGNIGLSTYSTTHNAGATTLAGNSA
SGF

>Homalodisca vitripennis JJNS02005999.1 EFLaR

LSQGIVFLVGILGNLMVMVVKRTRSMHSP TNCYL VSLAMADMVVLVASVPNEILSYYL VGNHWLWGD
GCSLFVFFQNLGINSSSLGLIAFTFERYMAICHPMKAHKVCTQRRAKKIIFSVVVLAVLYCSPWLFLTTTKP
LNYRGFPQARFCDFKRPRDEYLPYYFTDLVVFYLVPLFVSCVLYGLIARTLLNRRVIRAAGKASSTVV L
TEA ASSRSQVV

>Laodelphax striatellus QKKF02020908.1 EFLaR

MDTSNESTDIYDVYDYNRTFQTNC SYPLPYYSFRYRLIGTVFQTIIFTSGCLGNIMVITIVSRCRTMRTPT
NCYL TSLAVADIMVLVASVPLNIASYV VSEQWLLPDITCSLVIYLQYLGINCSTLSLVAFTVERYIAICHPM
KAHKMCTLHRAKRIILVTWLIAIVYCTPWFTTVGMRSIN YRHFSIKKCDFLYNRDVYFRFYFTDLVVFYIFP
LLLTCVLYGLIMRTL MRRSGGIGRCVRKNSVKA EIQSRMQVVKMLALVVALFAILWLPYRGLVYNSLAS
MFGGALYMQPWFLMFAKTSISAINPILYNAMSTKFRNEFRKLLVCGGSEDTARHNLGSSRCHTASNISRTH
VKVTDLEL

>Locusta migratoria QGT41395 EFLaR

MRPAGAAVALAALLPLLLAAGAAASDA AVAPPAEPA YYSARYRLVGTL CQGVLAVGLAGNLLVAV
VCGARSMRSP TNCYL VSLAVADCLVLVASVPNEIASY YLVGNQWLWGDAGCAAFVFSQNLGINASALS
VAFTVERYVAICRPLRSHALRSVARARRV SLLAWAAAAAYSAPWLLLAATRPLRYRGLPELRACAFRLER
ARYLPYFLCDLLLFYAAPLLLC CVLYALIAARALFRRAAL AASGGAGLSPHASAAGVDARCQVVRMLAAV
AAFAALWLPYRGLLVYNSFATLLSGDKYMDLWFL LFAKTCVFVNSAINPILYNAMSAKFRRAFRRALLRC
TRRAAAAAAPADGPLSGSGGTRLMV

>Nilaparvata lugens_A45 EFLaR

MDITNASTNMNDPSEDNDLSYDDYNLNL TLQSNCSYPLPYYSFRYRLIGTLFQSIIFTSGCLGNIMVITIVSR
CRTMRTPTNCYL TSLAVADIMVLVASVPLNIASYV VSEQWLLPDFTCCLVIYLQYLGINCSTLSLVAFTVE
RYIAICHPMKAHKMCTLHRAKRIILFTWVIAIFYCTPWFTTVGTRSIDYRHFTIKKCDFLYNRDVYFRFYFTD
LIVFYIFPLLLTCVLYGLIMRTL MRRSGGIGRSATVRKNSVKA EIQSRMQVVKMLALVVALFAILWLPYRGL
LVYNSLASMF GGALYMQPWFLMFAKTCIFINSAINPILYNAMSTKFRNEFRKLLVCGGSEDT RHNLGSSR
YQTASNLSRIHTKVTDLEL

>Orchesella cincta ODM93884 EFLaR

MAKPLETVLYEDPIYFSESYRLIGTTIQGLIFLVGVLGNLLVVFVVARSRSMWCPTNCYL VSLAVADCIVLV
AAVPQEIVSY YLVGSEWIWGDAGCSFSIFAQNLGINASSLSVA AFTVERYIAICKPFLAQT VCTVRRALKIVL
CVWSFAAIYSSPWLYLAATFPIYRGFPPLKMCDHKL SREEYLGYYFADLVVFYLIPLFLCIFLYSQIAHRLI
NQPFNGSPPIIIIGNRRCVELQPNFRTSSRSQVVKMLGFVSALFAVLWLPYRGLLVYNSVAQE KYMNLWYL
MAAKTCIYLSAINPILYNAMSIRFRSAFGRALSLSVCSKDHV

>Rhodnius prolixus GECK01070320 EFLaR

MKAHKICTIGRAKKITVGMWVFAIFYCSPWLFL TETVPVNYRGYPEIHQCIFKRPREEYLVGFFDLVLFFYV
IPLILSCILYTLIIRSLNERGKVTVKGAPKGSVALEAVNTHSKSQVVKMLAVVAVFAVLWLPYRGLLVYNS
FMTLFGKSPFMDLWYLMFAKTCVYINSAINPFLYNAMSTKFRRAFHRLVCKRATRPPVITISTVAGPSLSS
ASSSHRETTTVSVV

>Tetranychus urticae_tetur21g02030 EFLaR

MFMLIFLVTTIWIILSICCCCVQLTKITKESTKMDPFFNTFDNLPLFSNDSLLESNTTDLANSLLAGCDYVTD
TANRLTDNSSTLLTSSSSSLVSLFSSSLALNSPSSPYFQSSPLSSSSSSSPYPSPLSLSSSSILSSASSSSVLSLSPSS
SISSSSLNSANSYDPATGTASPAVVAAAAGFSPETYCNNLNTTFCCKDPSYYAISYRIIGTIFQGFILIGVLGNI
MNVIVVVKTRSMRTPNTCYLVSLSIADLMVLIAAVPNEIIAYYVLGDQWIWGRVGCALFIFFQYLIGDASSL
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KTTTASTANQINSSNGPKILRFTVQRSSDHCKQAI EAL

>Thermobia domestica (Veenstra and Simo 2020) EFLaR

MNKTSNILWNCSEYLTSTEDEFSATNTNLNCTNISVDSVTNNTASLTNQTELPDPEYFSYTYRAIGTFFQGIV
FIVGVLGNIMVVIVVKRTTSMHSPNTCYIVSLAIADCLVLVASVPQEILSYYLIGNQWIWGDIGCMLFVFCQ
NLGINASSLSLVAFTVERYIAICHPMKAHAVCTVKRAKKIIGVWVFAVVYCSPWL YLTHTVPIPYKGHPDI
RRCHFCLPREQYLAYFFADLVVIFYVPLLLSCVLYVLIARVLFMKKVVKSCGNMNGTSLIDSTSTNTARAQ
VVKMLAVVVAVFATLWLPYRGMLVYNSFRKMYSKPEFMDLWFLMFSKTCIFINSAINPILYNALSYKFRR
AFHRTLSCGNHSRDCRYMSSMGMSTYTCSVTIPSTPRQNHNDHVTTF

>Timema genevievae wsg CABFWO010000395.1 EFLaR

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TRRFGVDKSNRLQGNATSSSTSSSKDQPYRGMLVYNSFAMLFSRKRFDLWFLMFAKTCIYINAINPILYS
MMSAKFRRAFHRVLCGTGPLNNHDTPTSTRN

> Homo sapiens CAA50979 TRHR

MENETVSELNQTLQPRAVVALEYQVVITILLVLIICGLGIVGNIMVVVLVVMRTKHMRTPTNTCYLVSLAVA
DLMVLVAAGLPNITDSIYGSWVYGYVGCLCITYLQYLGINASSCSITAFTIERYIAICHPIKAQFLCTFSRAKK
IIIFVWAFTSLYCMWLWFFLLDLNISTYKDAIVISCGYKISRNYYSPIYLMDFGVFYVVPMLATVLYGFIARILF
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SFLSSPFQENWFLLCRICIYLNAINPVIYNLMSQKFRAAFRKL CNCKQKPTTEKPANYSV ALNYSVIKESDH
FSTELDDITVTD TYLSATKVSFDDTCLASEVSFSQS

>Pyrrocoris apterus EFLaR

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AVWGFACVYCSPWMFGLTTTRPLKYQGYPDFMECAFQRPRNEYLFVFFTDLVMFYVIPLILSCILYYYISR
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MFAKTCVYINAINPLLYNVMSTNFRQAFHRVLF GKKAASSRGPRASLAPSTLSSQTL

ETH-Receptor protein sequences

>Acyrtosiphon pisum XP_016661081 ETHR

MISALDVVAFGNDSSPLTVAGNDTAGGAASSPNDTAANGVIQFLDDDL SFPGYIRTTMVVCVILG VGVV
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>Anopheles gambiae XP_003436278 ETHR

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>Apis mellifera XP_026301803 ETHR

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>Bemisia tabaci XM_019060034 ETHR

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>Blattella germanica PSN38047 ETHR

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>Bombyx mori NP_001165737 ETHR

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>Ceratomyx gallinae GAWK02012953 ETHR

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>Ctenocephalides felis XP_026474054 ETHR

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>Diaphorina citri AWT50629 ETHR

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>Drosophila melanogaster NP_001287439 ETHR

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>Ephemera danica contig_25199_: AYNC02025199.1 ETHR

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>Frankliniella occidentalis XP_026279131 ETHR

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>Frankliniella occidentalis XP_026279133 ETHRb

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>Homalodisca vitripennis JJNS02001400 ETHR

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>Ladona fulva APVN02001164.1 ETHR

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>Laodelphax striatellus QKKF02037815.1 ETHR

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>Locusta migratoria GCGJ01035844 ETHR

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>Myzus persicae XP_022182490 ETHR

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>Nasonia vitripennis ETHR XP_001606566

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>Nilaparvata lugens_Nl_A6_a ETHRa

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> Nilaparvata lugens_Nl_A6_b ETHRb

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>Orchesella cincta ODN00182 ETHR

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>Pediculus humanis XP_002429932 ETHR

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>Rhodnius prolixus GECK01040487 ETHR

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>Tetranychus urticae tetur30g00050 ETHR

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>Tribolium castaneum NP_001076792 ETHR

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>Zootermopsis nevadensis XP_021916331 ETHR

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>Pyrrhocoris apterus ETHR

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>Pyrrhocoris apterus ETHRb

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