

Fig. 1

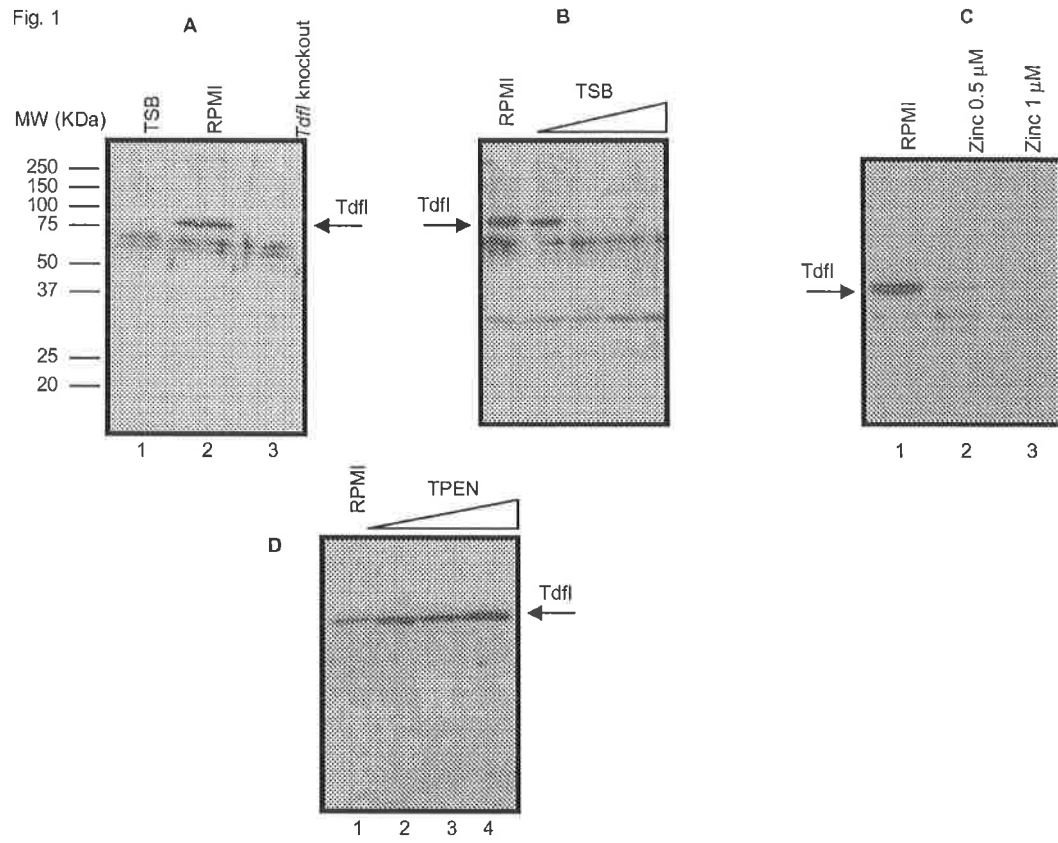


Fig. 2

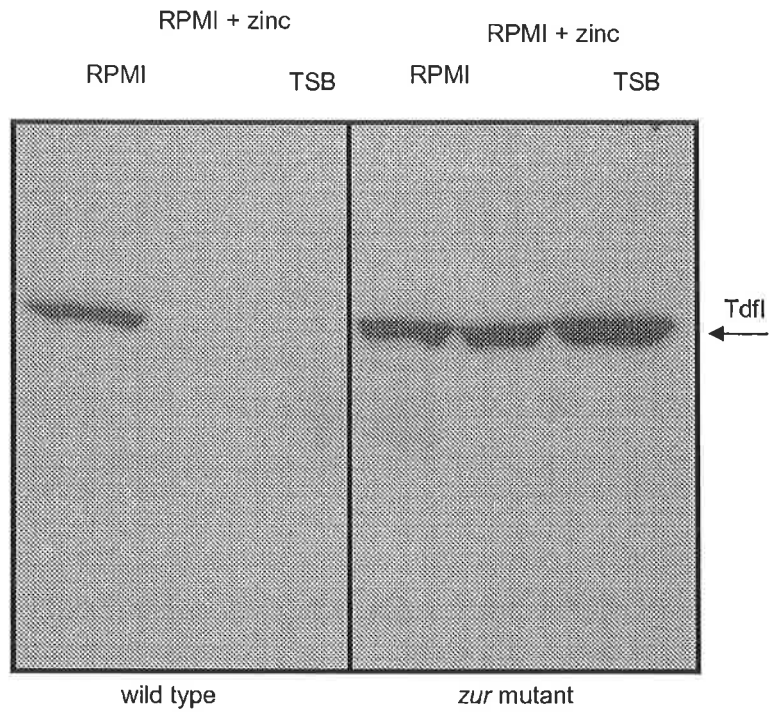
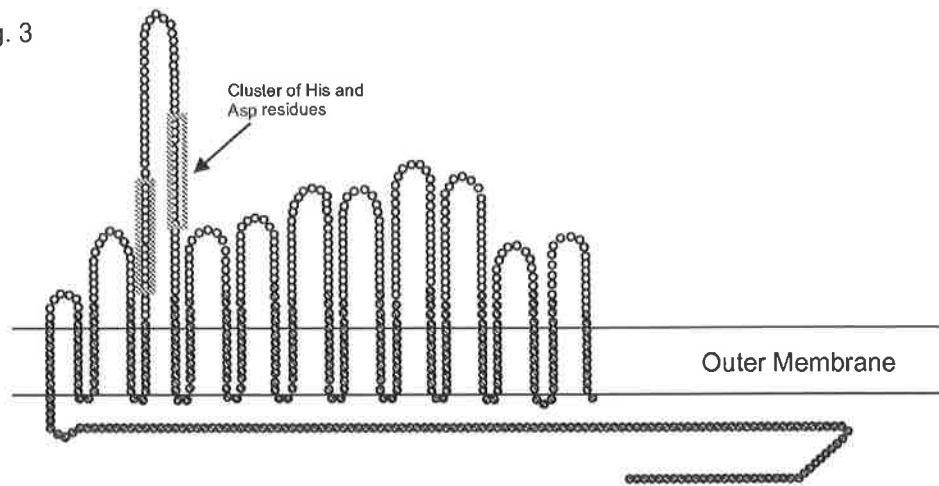


Fig. 3

A



Loop RDQYGLPAHSHEYDDCHADIIWQKSLINKRYLQLYPHLLTEEDIDYDNPGLSCGFHDDDNAHAHTHS

B

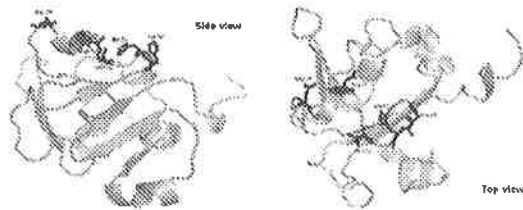


Fig. 4

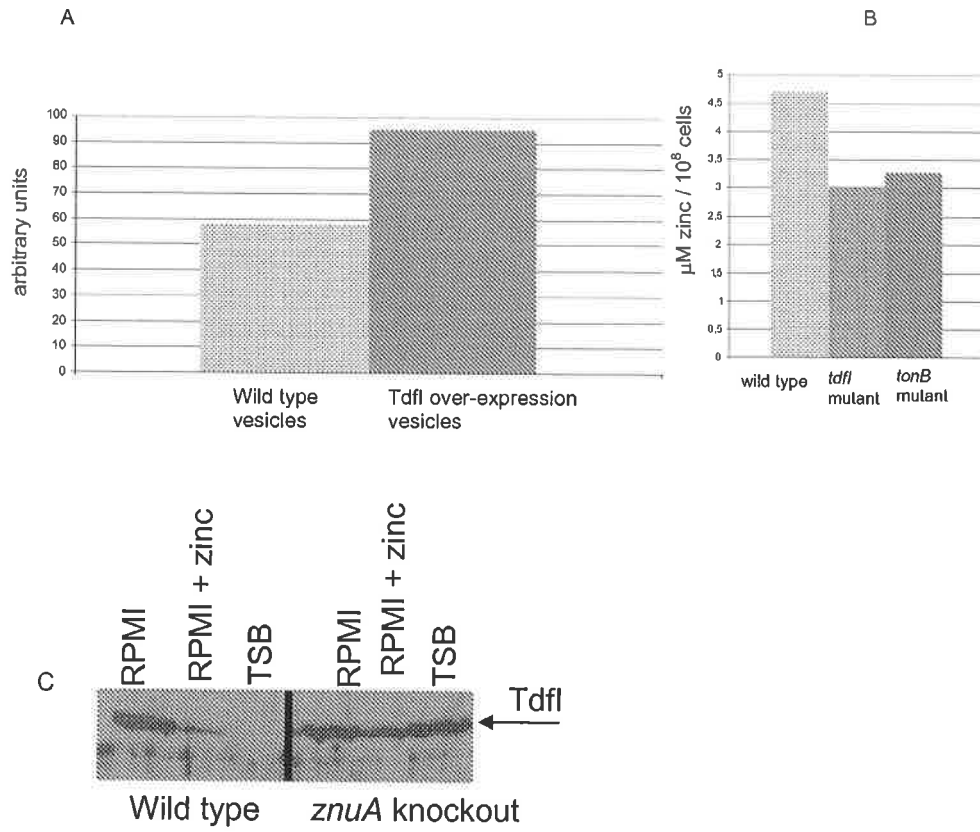


Figure 5

Expression of Tdfl in 32 different *Neisseria meningitidis* strains

Strain	Serogroup	Clonal lineage*	Zinc		Strain	Serogroup	Clonal lineage*	Zinc	
			-	+				-	+
Z2491	A	IV			MC51	C			
FAM 18	C	ET-37			MC50	C			
MC58	B	ET-5			126E	C	-		
B40	A	I			2208	A			
Z6835	A	VI			BNC.V	B	ET-37		
Z3524	A	III			6940	B	-		
Z6466	A				M981	B	ET-2		
ROU	W135	ET-37			M992	B	-		
BZ10	B	A4 cluster			881710	B			
BZ198	B	Lineage 3			881607	B			
NG G40	B	ET-57			2996	B	ST-8		
NG4/88	B	ET-67			S3446	B	ET-8		
BZ147	B	ET-164			13077	A	IV		
297-0	B	ET-69			B16B6	B	ET-37		
M990	B	-			H44/76	B	ET-5		
35E	C	-			8013	C	ST-18		

Fig. 6

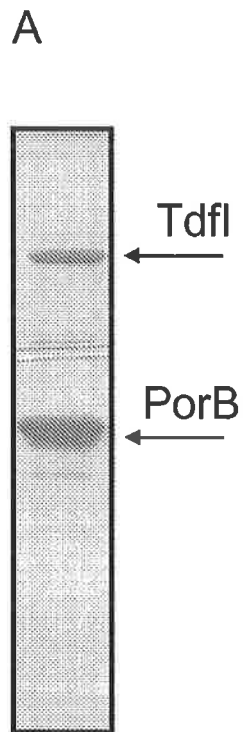


Figure 7

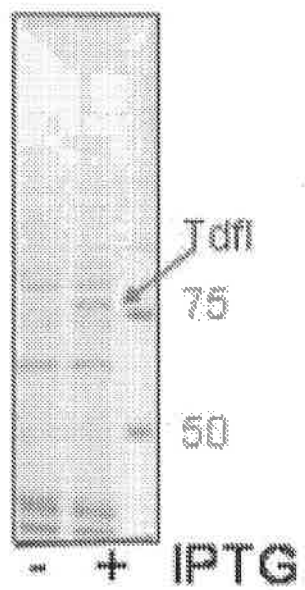


Fig. S1 (Supplementary Figure 1)

< Signal sequence > <Tb> < plug domain

MC58 1 MAQTTLKPIVLSILLINTPLLAQAHETEQSVLDLETVSVVGKSRPRATSGLLHTSTASDKI 60

O53422G...T.....

Z2491S...G...G.....

FAM18

α 14

α 153DR.....

α 275

Plug domain

MC58 61 ISGDTLRQKAVNLGDAIDGVPGIHASQYGGGASAPVIRGQTGRRIKVLNHHGETGDMADF 120

O53422

Z2491

FAM18 L.....

α 14

α 153

α 275

plug domain >< Tm1 >

MC58 121 SPDHAIMVDTALSQQVEILRGFVTLLYSSGNVAGLVVDADGKIPEKMPENGVSSELGLRL 180

O53422

Z2491S.....

FAM18

α 14

α 153

α 275S.....

<loop1>< Tm2 > < Tm3 >< loop2 >< Tm4

MC58 181 SSGNLEKLTSGGINIGLGKNFVLHTEGLYRKSGDYAVPRYRNKRLPDSHADSTQGSIGL 240

O53422K.....

Z2491

FAM18

α 14

α 153

α 275

> < Tm5 >< loop3

MC58 241 SWVGEKGFIVGAYSDDRRDQYGLPAHSHEYDDCHADIIWQKSLINKRYLQLYPHLLTEEDI 300

O53422A.....V

Z2491A.....

FAM18

α 14V

α 153A.....

α 275A.....

>< Tm6 > < Tm7 >

MC58 301 DYDNPLGSCGFHDDDDNAHAHTHSGRPWIDLNRNKRYELRAEWKQPFPGFEALRVHLNRNDY 360

O53422N.K.....L.....

Z2491D...A.N.K.....

FAM18D.....

α 14D...A.N.K.....

α 153D...A.N.K.....

α 275D...A.N.K.....

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      <   loop4       ><   Tm8       > <   Tm9       ><   loop5
MC58      361 RHDEKAGDAVENFFNNQTQNARIELRHQPIGRLKGSWGVQYLQQKSSALSASEAVKQPM 420
O53422    H.....K.....G.....T.....
Z2491     .....G.....T.....
FAM18     .....T.....
α14       .....T.....
α153      .....T.....
α275      H.....G.....T.....

      ><   Tm10       > <   Tm11       ><   loop6
MC58      421 LLDNKVQHYSFFGVEQANWDNFTLEGGVRVEKQKASIQYDKALIDRENYYNHPLPDLGAH 480
O53422    .....E.....KQ.....
Z2491     .....R.....
FAM18     .....R.....
α14       .....R.....
α153      .....R.....
α275      .....R.....

      ><   Tm12       > <   Tm13       ><   loop7       >
MC58      481 RQTARSFALSGNWYFTPQHKLSLTASHQERLPSTQELYAHGKHVATNTFEVGNKHLNKER 540
O53422    .....
Z2491     .....
FAM18     .....
α14       .....
α153      .....
α275      .....

      <   Tm14       > <   Tm15       ><   loop 8
MC58      541 SNNIELALGYEGDRWQYNLALYRNRFGNYIYAQTLNDGRGPKSIEDDSEMKLVRYNQSGA 600
O53422    .....
Z2491     .....
FAM18     .....
α14       .....
α153      .....
α275      .....

      ><   Tm16       > <   Tm17       ><   loop9
MC58      601 DFYGAEGEIYFKPTPRYRIGVSGDYVRGRLKNLPSLPGREDAYGNRPFIAQDDQNAPRVP 660
O53422    .....L..A.....
Z2491     .....
FAM18     .....
α14       .....
α153      .....
α275      .....

      ><   Tm18       > <   Tm19       ><   loop10 ><   Tm20       > <
MC58      661 AARLGFHLKASLTDRIDANLDYYRVFAQNKLARYETRTPGHHMLNLGANYRRNTRYGEWN 720
O53422    .....V.....
Z2491     .....V.....
FAM18     .....V.....
α14       .....V.....
α153      .....V.....
α275      .....V.....

      Tm21 ><   loop 11 ><   Tm22 >
MC58      721 WYVKADNLLNQSVYAHSSFLSDTPQMGRSFTGGVNVKF 758
O53422    .....
Z2491     .....
FAM18     .....
α14       .....
α153      .....
α275      .....

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Fig S2 (supplementary figure 2)

CLUSTAL FORMAT for T-COFFEE Version 6.07 [<http://www.tcoffee.org>]

A. baumannii MLNLSK-----LFLAL-TPLGASK-ILL--AA---EGPVTTTNTI
A. pleuropneumoniae MFNKKL-----LAVL-ISAQFSP-LVW--AN---NNDVAVLDEY
H. parasuis MNNRTE-----QQNRRT-FSLAFSL-LCCGI---NAQVLELEI
E. pertussis MICYIVSFNENGTSFYREGNMRFERHPLSAAL-ALALAWQGAHAQASADGTSEAAITAPI
M. catarrhalis MKVTMI-----KKPLACAI-LATFSM-PMLAEANLKD-KPTVTLECV
N. haemolytica ML-----KKNYLTVSI-I-LAISG-VGYA-----NFISITETI
P. multocida MPLLTLKINM---F---F-MRKISYLSLCVSIYALYSQ-LAVAQSPKLNKNTSEHIELEPI
N. meningitidis MAQTTL-----KPIVLSI-LLINT--PLLAQAE--TEQSVDELEV
* * *

A. baumannii VLTAQSDDELGSELLGKSLNVSNQFIDTSK-LKQRSTTLGDALGTELGHSNQYGGGASAP
A. pleuropneumoniae SVMSGSTPFISQGSSEVTLKLVSDKI IAGKE-FKKRSATLGNALAAELGVHSTPFEGGASAP
H. parvus SVMGKVEF---GNSISFLKVSDAI I DGEK-FKNRSATLGNALSSSELGVHSTPFEGGASAP
E. pertussis TVSA--SPL-AG-DLDSMTAAPAVLEGGDQLLLRRQGTGLGDTLDGLPGVHADTFEGGASRP
M. catarrhalis SITSLADQNTFEFVNHRSATVSGTTSVSKQ-LQQRATTLGDALAGELGVHSHNFFEGGASAP
M. haemolytica TVDGTNPSTKGKLLGGEISNSNEVVDEN-KRQGSITLGNALSGELGHSQFEGGAGSTP
P. multocida FVNTLIESREGAPLGGRLMASEKI I PAYS-LKQRGSNLGDALSSSELGIHASQFEGGASAP
N. meningitidis SVVGKSRPRATSGLLHTSTASDKI I SGDT-LRQKAVNLGDALGVGPIHASQYGGGASAP

* * * * *

A. baumannii IIRGQEGKRIKVLQNNADVLDMSNMPDHAVTVEPSLAKSIEIRGASTILYSSNSAAGV
A. pleuropneumoniae IIRGQEGARIRILQNGSDVIMDNLSPDHAAVDSLAKQVEILRGSSSTLLYASSSPAG
H. parasuis IIRGQEGVRVKILQNNADVIMDSNIPDHAIATDTLTAQVEILRGASTILYASSSPACI
B. pertussis VIRGQTAPRVKVLSDGSELMDASAI SPDHAVTTEPLLADKIEVLRGPATLLYGGGAIGCV
M. catarrhalis IIRGQEGKRLKILQNGSEVDDMSGLSDPHAIATVDTTLAKQVEIVRGSCALLYAGNSCAV
N. haemolytica IIRGQESKRAKILQNNNGENLDMSGMSPDHATVDAALLAKRIEILRGPTLLYISAGNTAGV
P. multocida VIRGQEGKRIKVLSSGNETLDMSSAMSPDHAAVDSLAKKVEILRGANTLLYSSGNAAGV
N. meningitidis VIRGQTGRRILKVLNHHGETGDMADFSPDHAIIMVTALSQQVEILRGPTLLYSSGNVAGL

A. baumannii VNVVDYKIPTQMPQDGLGNITLRFNTGSNEKLTAGTVTVGLSPRVALARAEGLYRNAGNY
A. pleuropneumoniae VNVVDKRIPTETIPEKGYEVELNSRFDTAAEKVGALGATFIGIKHIAVRAEGLTHRSND
H. parasuis VNVVDQRIPNKMPKKGYEVTLSRFPDTASKEKVALGTIGIGIKHIALREGLDRQSNY
E. pertussis VNVLDRIKPTAVPQQGJEAEAEIRGATGCTKERACAGITITAGSG-NFAVRVEGLKRRSSDY
M. catarrhalis VNVVDKIPTKLPSPK-LQGVDTVRLSSANREKLTATASEAPLGEHVAVKVGCSQKQADY
N. haemolytica INVVDNKIPTAIPEKGYEQQGVRFVFGSARKELYTAGSTFALGNHTALRVQGMYNKASEY
P. multocida VNVVDNKIPTAE-VVGVEGEVGLRTGSADNERLVNVALDVGLSKHFALHLEGLHKKAGDY
N. meningitidis VDVADGKIPEKMPENGVSSELGLRLSSGNLEKLTSGG-INIGLGNFVLHTEGLYRKSQDY

A. baumannii RTPHYQSSSYNSLEDLEN--QNIYVKNLKYLPE\$WAESKLGTLGL\$WIDNTYTLGV\$SYT
A. pleuropneumoniae RVPGINL-----GERLNVPDPTYNK\$KVGTGL\$FVGEQGYIG\$ASY\$
H. parasuis KVPQIKL-----GETLNVPDPTH\$SKVGTGL\$FIEGKGYLG\$SYN
B. pertussis RVPDWPD-----GKLG\$SYSES\$GQGTVM\$SWITPRG\$YVGVAFT
M. catarrhalis KTRPDRHVFNKKHEDDNTQPEFIYKDTLKHLPDSHAK\$NAGTL\$GV\$SWVNGQ\$FLG\$SV\$
M. haemolytica YAPHFTI-----EGKPYH\$RVF\$D\$VD\$SQ\$TG\$VLS\$VIGER\$HGL\$GI\$AT
P. multocida RTPSYQY-----QG\$THH\$KLANS\$FVDNR\$SG\$VGL\$SVW\$GDK\$YLG\$V\$AY\$
N. meningitidis AVPRYR-----NLKRLPDSHAD\$QTG\$S\$GL\$SVW\$G\$K\$G\$F\$IG\$V\$AY\$
* * * * *

A. baumannii HRHDEYGLPAHSHLYYGCFFASATSINTRISGLKNYLIYYPQIMEEQDTINYVNPDPCH--
A. pleuropneumoniae KRKDNYGLPGNNHFDYGLGHIHYGN---KQKGKAYTYLYPHLLGEENIG-SNPFPHCGG?
H. parasuis QRKDRYGLPGNNHFDYGLGHIHYGN---RLQKGHSYTNLYPHLMSDEWVT-ENPHFHCGT?
E. pertussis HIESKYGLPGNNHLYYGCFFPHG-----SHLHCGG?
M. catarrhalis LRKDKYGLPNHSHRYEEGCVHGSISQ--SALQYKPYRLRYFLFMENDDLFDNAGLCHET?
M. haemolytica DRDKYGLGHTHYDNYDYSISQ--AVMFAKGYLRFYPHLAEEGDIDYNNPGLRLL--
P. multocida QRKDKYGLPAHSHLYDEYDHEVLLS--DAHWRKPYLKHYPFLMEETDIDYNNPGLDCIKK?
N. meningitidis DRDKDYGLPAHSHLYYGCFFADIIWQ--KSLINKRYLQLYPHLLTEEDIDYDNPGLSCGP--

A. baumannii -----QH-----NHITETTFES-----NAPYDINTRYDMRCEFTCPFTGIDK
A. pleuropneumoniae -----HAEQTHLIDH-----PGLDH-----DTH-----PGFVVDLESKRFVDYAEILKCPFKGIDK
H. parasuis -----YDLDGSHSRD-----PYGHD-----DTH-----TGPWVDLHSKRTDITCKEIKCPIMDK
E. pertussis -----HGHGCHLH-----EADLDH-----CHGAG-----GACGVVYVVKLSNRTD-----RAEYITDTPFAGFEK
M. catarrhalis -----HEHDAH-----DHEGHD-----LDH-----CKPWLDMKMYRDVCGQTNAFFAGIDK
M. haemolytica -----HTH-----PGGSH-----Y-----GDTH-----CKPWLDMHSKRYDLDGSLQNPLPGFEE
P. multocida -----EWGSHGHCHGHGHHG-----NGCHSHDHHAH-----ADHIALNTGRWD-----KEWNKPNVGLDK
M. meningitidis -----H-----DS-----DNAAH-----DTH-----GRPWDLRNKKYE-----AEWCKPFGFGLK

A. baumannii RTSLSYIDYDFHNELEGDKI-----TNFKKNTGKVGRIELSHQ---
A. pleuropneumoniae IKVSYADADYHDEKDAVLATRYH-KQLKKDDYDGKPVNI FKNRQGNARLEIYHA---
H. parasuis IQLSYAQTDYHDEKDAKSGSDTINPNRVDKSDPGKVNIFKNQGNARLEFPHHT---
B. pertussis IRFRGGLTDYRHDEIEGGQL-----GTRFQNRGYDARLELTHR---
M. catarrhalis IRASMGKVVDYIHIDEIDGGEK-----TSFFCNQANVWRLEASHTPIHT---
P. haemolytica AKISANYVDYHDEKDGKRV-----ENYPKNKGKGLRFELVHK---
P. multocida VRPSIAKVGYRHDEKSGAIS-----DNSPKNKGY SARVEFLHQ---
N. meningitidis LRVLHNRNDYRHDEKAGDAV-----ENFFNNQTNQARIELRHQ---
: . * * * . * * * . * * * .

A. baumannii FLGELTGILGLQYLEQDNSALSVPVHSQEGHTTYLDTCQLLNRVNTKNFSVFGLEKYNW-N
A. pleuropneumoniae PLGGLGTGVWGVCYQTKQSSMHPKK-----REVKFLPVLENTKNQMSLFGIEQYMW-
H. parasuis PIGGLTGSGVGVQYQLTQSSANTPND-----REVQPLVDNRNKGISLFALEQYAW-D
B. pertussis PLYGWHGVGVQYQTSYSDFRFA-----TGEEAFLPRSKTRAGHGLFIEYRW-A
M. catarrhalis PMKGKSGVGVGYLTSTKNSGLVPVPRYEDG---NKQDTQNTLHNKTKTGVSFVFFEEYKND
M. haemolytica EWKGLKGAIQVGYQYTKQSTGSALEASRAA---KVPNKQPLLNKPKTKLWSTFATERINL-G
P. multocida PLAGVSGILGLSHVYQDSYALDNHTL-----EYRKQNLLSDHTTAQQSFLMEHVEL-G
N. meningitidis PIGRLKSGWGVQYQLQKSSALSATS-----EAVKQPMILDNKVQHYSFPFVQANW-D

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A. baumannii      DFTFELGARIEKQKVSMDYDIEIKIDSMKPPWPNKYNPSFYVEKNNKIRAQNLK-SILEAVQ
A. pleuropneumoniae NFALEFAGRVEKQKIEIEYDRNEIKRLQDHYRIS-----GGK-QVEPDLs
H. parvus        NFAIEGLGRTEKQNIHIDYDLAKIQKQKFNERT-----YGK-QVDPDLs
B. pertussis     DWRFELGARQDQWRVSFQ-----SGAP
M. catarrhalis   KLTVDAAARIEKQTIIMDYDKDAIYQSLNLGLATAHEPDI-----RFKRLLDsGTLN
M. haemolytica   DFTFELGAERQKIAMYDVKLLDRWLGFT-----PMNPLD
P. multocida     KWQFDIGGRVEKQRIAMKYHFNVPKDEQP-----PEELTR
N. meningitidis  NFTLEGGVRVEKQKASIQYDKALIDRENYNH-----PLPDLG
.      . : . * : *

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A. baumannii FPKETAFSYAGTVHWRFPAPNYILSLGTGHTQERLPNAQEMYTHGMHLATNSFEIGNRFLRK
A. pleuropneumoniae PYNQNAYAYASSITLWFFPHDYQLSFTASHNERPPTPMELYHHGHGIATNSFEYGNKDLKK
H. parvus DYDEKAISYTGAFNWFPHDPYQLSFTASHNERPLTPMELYHHGHGLATNSFEYGNKDLKK
E. pertussis ASRTAGTSLSAAIWDFAPQYSLSLVSRSQRPLPSAQELADGVHLATNTYPEIGDPLDR
M. catarrhalis PKTKQTARSYAVGTHQLTPKHKLSSLHQERLPNAQELAHGMHLATNSPEIGNRFLNK
M. haemolytica PHKDQYSFATHWLYFPNNHKLTALNAHQERLPNAQELAHGKHALNAFAEGNNKLLKK
P. multocida PHFKSKAYSALGANYYQLNEHQFNMIIVSHQERLPNAQELAHGKHLATNSFEAGNNKLLTK
N. meningitidis AHRQTARSFALSNGNWYFTPOHKLSLTASHQERLPSTQEYL AHGKHVATNTPEVGNKHLNK

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A. baumannii      EKSNNLEISLAYKDDLLDYQISTYYYPNYYIYLQTLNEVL-----GTTKVRDQHT
A. pleuropneumoniae EQSNNVELGLGQYTERVKYGVNYYNHPKNYIYNENLFR-----ENQ
H. parvus        EISNNFELGLGVLTDLKDYKLSTYNNPNPNYYINETLYR-----GNN
B. pertussis     ETSRNVDLTLRKHSQDPTFVSAPHNVRKNYIYANTLDR-----YED
M. catarrhalis   EKSNNIDLGLTFQGDKWDYLRGCGHYHDFPNYVFLQSLQYK-----QGLRGMRHDKD
M. haemolytica   ERSNQIELSTAYVGDKWDYKLNLYHTRYGNYIPI,TL,NNR-----GPKSTPDEYN
P. multocida     ERSNNVELGWGYTGEKLG1KLSGYYQQPSNYIYAAILLNKTSCPWRPNRSCRLSLSDDY
N. meningitidis  ERSNNIELATGYEGDRWQYNLA,LYRNPNGNYIYAQTLNDGR-----GPKSTEDDSE
* * : : : : * * : : : : *

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A. baumannii LRNHYSQSAANFYGLEGNIGYQPNFSVYHGSLFGDYGKGRLTNLPDAVIAYDIWNRE---
A. pleuropneumoniae LFMRRYNQAKARFYGLEAEASRYRPNDKQYATIFGDMVRGWLNTPLPKLVNSDVSVPFK---
H. parasuis LFMRRYNQAKARFYGLEGIIYNRPPTDQYQSFVSGDMVGKIKCIPPLIKGINDVYGEPIIN
B. pertussis FRLEIYETQRDAEFTGVGEVGRHPRGKVPASAFFGDYVVRGRLTG-----
M. catarrhalis LKTARYEGAAAKFYGPEDNIGYQINDVYHVALFGDYTRGKLTNI.PDKKQRTDAYGN---
M. haemolytica LKVNRYYOGAEARFSGAEGEIGYLTNPYRLAVFGDYVRGKLVLNLPNIAMSYNIWTGE---
P. multocida LRLRYRNQAKAKIYGLEAEVSYQISSTHSVSI.FGDYVVRGKLKDLPSLPIGYKYIYN---
N. meningitidis MKLVRYNQSGADFYGAEGEIFYKPTPRYRIGVSGDYVRGRLKLNPLSPGREDAYGN---

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A. baumannii -----PTLADQKDRYTPRLPPARLGTRLIKADFDCESLKGEIEYYRV
A. pleuropneumoniae -DYLPKDAKPG-----EDYLLIYQAQDTPKTPPPVRLGFRNAEFTPNWGGDLLEIRK
H. parvus PCYDPEYDEPEDCYRYRFLGKEMIKQADRVSLPPIRLGARFNQAJLTENLSSGVEVMKK
E. pertussis -----GGGNLPRIPAAARLGVRADAQWC-NWAGEVEYFHV
M. catarrhalis -----RP-----LIKQPSDITRLPKPKRLGMLTANVANWWSGGFLEYRHT
M. haemolytica -----V-----DKWASQDIPISAPRILPRLGARFANDENLNWGGLEYRV
F. multocida -NYDMVGVPQ-----TGWEKQPDGNAPRMSPMRLGIKWNAYPCKNGISFKTQLYRV
N. meningitidis -----RP-----FIAQDDQNAVRPVAARLGPHLKASLTDRIDANLDDYRV
                                     * * * * *

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A. baumannii FKQDNISKFEQVTSGYNMLNMTLAYKNKLSHT--EYDLFFKANNLLDQKVYAHETFLPYI
A. pleuropneumoniae FTQRRTSQLEYITEGNTMLNIGVAYSNKWKDL--DYKISLNGTNLLNQPVYIHTSYHQFV
H. parasuis FTQNKVSKLESSTKGYQLLNASLNYRRQIKGV--EYTVSLTGNNLLNQAVYIHNSYHPYV
B. pertussis YRQDDIAAYESSTPGYDMVNATIRYRGKLDRT--AYEYLRGNLLNKLAFNHASFIISTV
M. catarrhalis FKQDKLANFERPTPAHNLVNLGLNYQHKPSHQAGSVQVFFNANNLLNDKVFAHETFFPDM
M. haemolytica FAQKKVSKYEQVTPGHHQVNLGVTYSNHFNQ--EYQVFLKVDNLLNQKMYQHASYLPHI
P. multocida FAQNKVARLETPTKGHTMLNLGMSYDGKMGNN--EYTLFANVNNVLNSRVYNHTSFLSYI
N. meningitidis FAQNKLARYETRTPGHHMLNLGANYRRNTRYG--EWNWYVKADNLLNQSVYAHSSFLSDT
: * ; * * . ; * * ; * : * . : * :

A. baumannii -PQIGRNFSLGLNLNF
A. pleuropneumoniae -PQTGRNFILVVNVKF
H. parasuis -PQMGRNFILGLDLSF
B. pertussis APLPGRSVLLGVRLTY
M. catarrhalis -PQMGRNFMLGANFKF
M. haemolytica -PQMGRNAMLGMNISF
P. multocida -PQSGLGGLNVGMNFKF
N. meningitidis -PQMGRSFTGGVNVKF
* * . * :