

**Figure S1. Deduced amino acid sequences of GSB mucins and alignment with mucin orthologs.** Black boxes mark the deduced initiation and termination codons. Functional domains are indicated in coloured boxes: O-glycosylated region or PTS domain (yellow), extracellular proteolytic cleavage site SEA domain (orange), transmembrane domain (TM) (red), immunoglobulin domain (Ig) (grey), vW-D domain (dark blue), C8 domain (blue), and cysteine knot domain (CK) (light blue). In each amino acid alignment, conserved residues with the GSB sequence are represented by dots.

### Intestinal mucin:

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GSB      : MTAP+TT+PH+Q+CT+EKDCPGCVGTCIFNTTLGGCFNCNEEFAFGDACVFGENDTSADIDPENR+P+TRNATF+TLRILMDFDAA+PF+
GSB      : D+INSPQSLEFIK+TLMQE+LEALCKEAD+PQNFK+TVQ+VIKLSSGSVLAESVVDYLYANNETQIQFVNNQLDGVLT+TKILND+TSN+
GSB      : L+NKISQVFNASV+TL+KELTFEPPEITNITDLKPFVNCTKFAQYTAEVINGQWQCVGPCKTNPDYCHQHGE+CFNNIKEGPVC
GSB      : RCFETSLKQYYGQQCDLFRYGP+GF+Y+GALFGSLAGALLLVIMIVIA+VI+AKKRYMGVWKTNPYNRRLSAFDEEFFDFSETG
GSB      : DHNFGAAGTYTSQGSRQH+L+

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## Mucin 2:

GSB : MARCIENNTVEIIPYECPPIQNITCANGKPKVILYDEYHCCNYSACDCECKGWGDPHYITFDGSYYSYQGNCTYILMEEI  
Zebrafish : .....I.....E...N...HY...Q.YT...F.E.....L.....  
Chicken : N.I.....V...VI.E.PPKP...S..LA..Q.I.DDL..WHWE...Y.T.....L.....  
Human : ..T.KY.....KV..E.PPMP...S..LQ..R.E.PDG..WHWE...Y.T.....L.....

GSB : SPRK-HLTIYIDNVLCDPTEDVSCPRSI IISYDSQVITLMNHNLIGAVQLEALKDGVRLKLPYSQGDVEVLNSGLNLI FE  
Zebrafish : R.QY-.....F...I.H.....N....K...FF.GA....MGD.L.T...AHNG.R..S.S...FLS  
Chicken : EK.VDNFG.....YH..ARDI.....A...RHE...E.R..TVKPN-T...VTV.KQP.A...KKFG.S.YE...R.V.  
Human : ..SVDNFG.....YH...NDK.....RHE...E.L.KTVH...-P...VQV.RQA.A...KKYG...YQ...Y.VD

GSB : IPRLNVIITFGINGFSVSLPFEHFGNNTQGHCGTCNNNQADDCMLPGGQLVESCAVMADYWPAAKHINPPDCKIP TLLPTS  
Zebrafish : ..Q...D...AT...N.....K...I...DD.S.....A.SG..DEM.TP..A...V  
Chicken : ..E.K.N...NGLS...R...SL.....Q..I...T...R..N.N.A.N.ET....QVVDPSK.Q.SPGL.PTKA  
Human : ..E.G...NGLS...R...HR.....K.Q...T.TTS.....S...SN.EAA..Q.LVNDPSK.H.PHS.STTKR

GSB : APEPPP-----TVTPCKPDSICDMLKSSVFEECHP FVSPDRFFQGCVFDSCHVSNAEVECTSLQTYAAACAQEGICLHW  
Zebrafish : GGDIK,-----PK...AHPD.F..G.E...A..AH...EN..M..E.....PA.V.....RS.S.L.....  
Chicken : PSTTTG-----K...ES...E..WG...K.REV.K...AA.....T.P.LD.....I...I..D.N...D.  
Human : PAVTV.GGGKTPHKD.T.SP..Q...D...A...AL.P.QH..DA.....F.PGSS...A...A...L...N...D.

GSB : RNHTK-LCTSDCPSDKVYKPCGPAEQPTCDDNFDKPPSKFTTEGCFCPDGMKLFNQESGICVDKCGCIDPEGIPREFNER  
Zebrafish : ..Y.N...NIE.AE...N.....P.....IPEQRTITVP.....E.TM...KD....S.....AS.T.....V  
Chicken : ..S..NG...YE..KH.E..A...I...T..KSSPQNET..IKQI.....TM...SGVD...T...GLDM....G..  
Human : ...HGA.LVE...H.E.QA.....KSSSSQNNNTVLV.....E.TMN.APGFD...KT...G.DN....G.H

GSB : FEYNCQDCICEESTKTVTCKPKVCPAPPQTNCTGPGFVLVSQTNPSDPCCSVFVCQCHSNTCPETNMNCPIGYKPVFVSP  
Zebrafish : .....E....RA.....S..GGNPEV..E.....NY...E...KQ..N.DVSM..PL.KK.N...A..LD..  
Chicken : ..TA.....L.GGNG.V.E.HK...EQNKKS...K..YE..VV..SE...PTVT.K.N.SL.TTEPPK.T...EVFSY..  
Human : .....K...L.GGSG.I.Q..R.SQK.V.H.VED.TY.A..V..A.T..N.T..K.N.SL.K.KPSV....EVKSK.V

GSB : EGGCCPEHRCDPKRVCVHKDIEYQPGMSVPAAVCQDCTCSFEVDPKSGLFKITCRLHQCKS-CDLGYEYVQTHSDECCGK  
Zebrafish : ..K...I..E.....T...T...VID..E.K...D....QF...K.GFV..NEK..P....DDF..-D...  
Chicken : SDE...VY..V.....Q.A..L.NS..FVDK.H..F..N...IS.Q.NV...ERIP.N.Y.EP...LQHVQG-....  
Human : P.R...FYW.ES.G...G.A.....SP.YSSK...V..DK..NN.L.NV.A.THVP.N.S.SP...L..APG-...K.

GSB : CVQTHCMVN-VNGTKQLVALGKTWSPLGSNCELYSCVKSGETLTTISSHIVCPPFQESNCKTETIQTAANGCCKTCVE--  
Zebrafish : .....-...VNH..QE.A.LPTSNGP.DKI...S.VNGQFI..KYT.Q...NI...QPG...LS...HV..D--  
Chicken : ...K...HTSHS.NL..NP.EFINDPYN..T...TSIKNQ.I.S..E.T..A.N.ES..PG..TFLP.....P-L  
Human : ..E.....KRP.NQHV..KP.DFK.DPKN..TF.....IHNQ.I.SV.N.T..N.DA.I.IPG..TFMP.....TPRN

GSB : -KEKACKLVMTKTHITHKSCQSYQEVQMPYCEGSCNTFTKYSEAAASMQHSCSCCKETRFSNRTIDLHCLNGEVVPTYI  
Zebrafish : -QI.G.Q.Q...DF.K.ND...EKK.D.A..G.D.....ANPGL.---.....QA..S.....A...D..NH...  
Chicken : DSPTP.S.RER.DF.VY.N.R.L.R.V.TE....G...L..VE.S.....VET.M.E.E.K.PS.HS.THK..  
Human : ETRVP.ST.P.T.E..YAG.T--KT.L.NH.S...G..VM..AK.QA.D.....E.T.Q.E.V.S.P..GS.TH..T

GSB : HVEECGCGHTECTRAVG-----QSARRRRSFTLA  
Zebrafish : .....S.SR.K.HE.EVSQ-----TLA..S.....VRFP  
Chicken : Y..S...QD...IVPESSESQSTEENDESTQNHK..AI.L.SK  
Human : ...S.Q.QD.V.GLPT.-----TSRRAR.SP.HLGS

## Mucin 2-like:

GSB : QQDLDLLQPHNSNDEMELCVAVFLALSVGSDVDVQARLVRNHVSSICSTWGREHFKTFDGDVYQFPPTCEYNLASDCHET  
Zebrafish : -----WRT.T-----VCM.L.....IQV.SKKVSPS...N...M..NF.....M....V...QSL  
Turkey : -----GLRAAS-----L.V.....NA.E.RKGRT...GHY.....NN.....M....FV...QD.  
Chicken : -----GLRAAS-----LFM.....NT.E.RKGRT...GHY.....NN.....M....FV...QD.

GSB : FQEFVHMKRKEHDGN-PTVSYVVVTINDLSFHLGKSLVTVNGIPVKLPYYNAGVQVERNVIYKLGKQSKVGLVVMWNGDD  
Zebrafish : IR...Y...T.RSTG-.K..R.S.....AIE.TENQ.N..EAK.T..VHVS..L..E.T..T..Y....T...K..  
Turkey : .R.....Q.ALNSN.H.E.Q.....T.F.VY.KPK.AV...RI..T...SS..L..S.D..T..YA.....QE..  
Chicken : .R.....Q.ALNSN.H.E.Q.....T.F.VY.KPK.AV...RI..T...SS..L..S.D..T..YA.....QE..

GSB : AVMVVDRDYANRTCGLCGDFNGVSVYNEFIHNDK-----ISSIEFGNKHKVHRPNDECEDPYEEEEESAEASLES  
Zebrafish : .....SK.S.....P.....QSG.T-----GYT...M...PN.TH.....NVD---NV.DQ  
Turkey : .....SK.G.Q.....P.....SGVAS-----YN..T...LQ..S.....D.-----TQA.P.  
Chicken : .....SK.G.Q.....P.....SGGESYMLCTCILYN..T...LQ..S.....D.-----TRA.P.

GSB : CKEFQTTCDQILRSEPWSCTNQINPEPYIQACVQDMCGCTNSTSD-FCLCSTLSEFSRQCCHAGGQPPNWRTQFCAKQ  
Zebrafish : .EK.RAD..AD..ED.K....WV...A..K..TN...NRQPEDE.TTA..A.....N..A...AK..NV.  
Turkey : .N.HRDE.EK..T.SA..AD.HSR..L.M.....K.S.K-GNE.S.....R.GE...EN..Y.T  
Chicken : .N.HREE.EK..T.SA..AD.HSR..L.M.....K.A.K-GNE.S.....R.GE...EN..Y.T

GSB : CPFNMVYEEESGSPCMDTCTHQDTSSLCEDHKMDGCFPCSGTVFDDISMRGCIQSECOCK-HNKIYNSGEVYRQNSEECT  
Zebrafish : .....HS.....K..NA...E.N.....P.....DT...PAEK.....S....L.KSE...Y  
Turkey : ..G...R..S.....LEV....E.Y.....E.....EN...PV...Y...L.G.G.SP..TISNEC....  
Chicken : ..G...R..S.....LEV....E.Y.....E.....EN...PV...S...L.G.G.SP..TITNEC....

GSB : CFEGQWACKSLPTPATCAVEEGSHVTTFDGKTYTFHGECYTLAKVESKDDASPKFTPLAQLAPCANQKFDTCCLKALKIV  
Zebrafish : .Q..S.V.M...G.GL.....F.....E....D.N.L.S---...CEES..II.G..V..FTHET....S.V..  
Turkey : .DS.R.T..D..C.G..S..G.....K....D...V....SAVNNTHAL.....GSTDGQ...T.V..  
Chicken : .DS.R.T..D..C.G..S..G.....K....K....D...V....SAVNDTHAL.....GSSDGO...T.V..

GSB : LNNDRNNVLMFTSDGTVKQN  
Zebrafish : F...K.P.FIKA...QH.  
Turkey : ..-..K....R....SL.  
Chicken : ..-..K....R....SL.

## Mucin 13:

GSB : MAQKFKLLFLLSLVVAACLVIPDNPVAAATIDAPVTTDPSTTNLPVSTKPSATSE-----PSVSTKPSATSEPSVSTKPSA  
Rat : -MSOSSGGTSTPTTT.TQPTSTSTQTPG.TQLLS..STP..TATQP.ST.TQ.PGTTQL..T..T..T.ATOPTX.STQT  
Dog : ---M.G.I..A...SISS.SHSK.NCRH..SYHN.YHH.NSYHH.NSYHHINS---YHQTN.YHHTN.YHH.N.YHQT  
Human : ---M.A.IH...ALLS-.NTATNQG.N.A..VT..ETA..GPT.AAAD.TE.N----F.ETA..-T..N.PSFP.ATSP

GSB : T-----SEPSVSTKPSATSEPSVSTKPSATSEPS-----VST  
Rat : PGTTQLPGTTSTP.TTATQPTS.SFQT.GT.QL..S..T..TTATQPTSTASQTPGTTQPPGGASSPTTTVTOPTGSS.Q  
Dog : N---SYHHTNSYHHIN.YHQTN.YHHTN.YHHIN.YHQTN.YHHTN-----SYHHINSYHQTNSTY.T.P  
Human : P---PIISTHSSS.I..PAPPIIS.HSS.TIPI...ADSE.TTNVN-----SLATSDIITAS----.P

GSB : KPTATSDPSVSTKPSVTVDPVSATP-----TSSEVTD AETSAPSLTTPNP-DSCDSNPCGPGSTCEARAYPNYVCLCQA  
Rat : T.GT.QP.GGA.T..T..TQPTGS.SQTSQT.QPPGGASS..VT.S..TGSN.P.....KSPA..VK-L.DS.F...LE  
Dog : T..I..T.ASRPS..T..T..T.S.----T.KPTSPIST.LTQG.VEEG.SSP.QGA..KGD...VS-LNST.F...FF  
Human : NDGLI.MVPSE.QSNE.S..TEDNQ---S.GPPTGT.LLETS..N.TG.S.P.QD...ADN.L.VK-LHNTSF...LE

GSB : GDIYNHVSNSCQNAKVFPGNLFAPELPYEPEMSDPKSTEFLEAABKIMSQLQEVFKANTTYTGSTVLKLEPF--TTARVW  
Rat : .YY..N-.S..VKGTT...-EIGMS.NETTD.E.KN.VN.OTLHSS..KFF.NT..K-.D.GQ.V...SKDSLM.S.SV  
Dog : .YY...-S..KKG...-TIKV..SEVSG.G.EN.LA.Q.LHN...EPPGGT..N-FD.GQ.V.DG.SIR--P...E  
Human : .YY...-S..KKG...-KISVT.SETFDPEEKH.MA.QDLHSE.T.LFKD..GT-.V.GQ.V..T.STS--L.P.SE

GSB : SREGNPHIKATVEISFTATADVTTDGVLEEIKSVDTCVNCLLNGATFISETLCAKN-----ACDAATTR-  
Rat : M.AATQT.YV..VNM.GENTKEDEES.ASV..EA.K.DN-.VERYFQDRCDYYGCVK-SGSNVCNRGLQCT.KPGLE.L  
Dog : M.A.GTG.EV..LNI.AE.TKENEGT...L.TKA.ENNKN.I.GYSNQS.CDYFNCEKENAQDKCDNGLLCK.KPGFE.P  
Human : M.AD.KF.NV..VTILAE.TSDNEKT.T.K.NKA.R.S.S.F.NYDL.LRCDYYGCN--QTADDCLNGLACD.KSDLQ.P

GSB : -----CLSTDGSKFCDC-----RESYVPTAFSDRMCIACPSGQGVDKGKCVKCSFGRSGLNCSESWQLTLVIVASVLGA  
Rat : NPQVPF..A--P.CSEP.SAEK-..LC.KKDNGAME.GCMAGYR-KAN...EE.P..Y...KQD...I.T..G..A..  
Dog : NPQIPM..A.AP.CPDT.NANNN..CL.NKDN.GVE..CLSGYKED.H.I.Q..G..YG...EDQ...I.T..G..G..  
Human : NPQSPF..A.SLKCPDA.NAQH-..CL.KKSGGAPE.AC.V.GY.EDAN.N.Q..A..Y...KDK...I.T..G..A.I

GSB : LLLITLILIPIVALKPSKKRS-----PKKNKNSRHSGALRQPHSB-----  
Rat : F...L...FI.SMRSKN...GEEQNLIEDDFHNLRM-RPTGFSNFGADTSIF..VKTGVP--SQTSN.YANHRSMRPD  
Dog : ...GL...A.IC..TRSKN.D.YIEEQNLIEDFQNLRLQQTGFSNLGADGSIF..VRA.IS--QPQN.YANHRSMRPD  
Human : ...SM...A.I.T.RSNN.T.HIEEENLIEDFQNLKLR-STGFTNLGAEGSVF..VRITASRDSQ.QN.Y.SHSSMPRPD

GSB : -  
Rat : Y  
Dog : Y  
Human : Y

## Mucin 18:

GSB : -----MEDRVEAYLGEEARINCMFTSAEGV GALRIHWFFVTRS GEKKQIY  
Tilapia : -----VMA.DT.Q.T....D...GTT.Q...LPNKK.QR..  
Zebrafish : MDNFRN MALQNTSLLLIVLQICALAWQAWAQVDLR...T.V...DDS.E.P...FT.APM.M.Q...VRE.D.V.VR.S  
Human : ----MGLPRLVCAFLLAACCCPRVAGVPGEA EQPAPEL...VE...ST.L.K.GL.QS...N-LSH.D...S.H.--...T.I

GSB : YLESTMKYADRGTQFTDRVNGTISPGTAVLTISDVHIEDEVEFICHIKSLT-EGREGRTKLVEDAPAFPSIEGIQTGIS  
Tilapia : NK.PMHEA.EQN.P....SLN..GTA..V.R..G.K.N....V....P.EA...Q.Q...KS.T....A.....  
Zebrafish : .SDL..QKV.EN.T....SVRSNSDGET...Q..K.S..R..F.Q.SGF.AGSD.R..L....P.EP.V...AL....  
Human : .RVRQGGQSEPG..EQ..SLQ--DRG.T.A..Q.TP...RI...QG.RPR--SQ.Y.IQ...K..EE.N..VNPL..P

GSB : VNEVNP SKIGTCEVKN GFKPNITWYRNTPLRPAQDEVEITLSVTVESSGLFSVRSELRMKVTKEDKDDQFYCEVTFV  
Tilapia : ...E...S...M...ITP...D.KS...T...Q...K...AK...L...  
Zebrafish : .SGESTA..A..T...HI..H..NGL.N.VTL..R...Q.D.HY...AH.S...  
Human : .SKE.EE.A..VG...I.Q.I...GR...EEK.R.H.QS.Q...Q.I..AQ.V...A...N.R.

GSB : PGGTRMTETNRINITVYYPSTAVSVWVESPKGKIKEGDSIMLQCRGNGNTPSSFLSFKHG-----EELPSEQDTLVLH  
Tilapia : ..A...QH...P.E.N...E.R.EN...Y...IT.I..Q-----NSGYFV.N.K..QT  
Zebrafish : ..AV.T...KG...S.E..K...Q.L...E.H.Q...P.API.FN.EQS-----DV..D.Y.GL...K  
Human : .S.NH.K..RE.T.P...EK.W.E..P-V.M...R.E.R.LA...P.PH.SIS.QNPSTREA...TTNDNGV...E

GSB : NATRLDSGVYLCISTD TDF--EEIAGNTTLFVHYLDPAVVIPEDTIVPQQD-LKATCNALSSVDTHTAWFKDGE--EI  
Tilapia : .V...G...E.TFME..N.--...S.S.K.L.N..ES...T.K...TVME.EE...Q.DIT...EK--L.  
Zebrafish : EV...E.HAL.L.AVNND..LDTLQ.T...K.E.MLKGES.T...E.S.V...K.L--  
Human : P.R.EH..R.E.QGL.L..M-ISL.SEPQE.L.N..SDVR.S.AAPER-EGSS.TL..E.E..Q.LEFQ.L.EETGOV..

GSB : SKGNTLIVKDATFDTAGTYECVVTVPEIEGMETRGTLVYVNVQGGQPEI IKPDN-TEMVQQVETTVSLHCKVRGFPAPRVEW  
Tilapia : .....S..S...E...M.K.....K.SS..Q...K.S...G.G--V.E..TY...N.N.SA.....T.M.  
Zebrafish : G..HI.Q.Q...R.D.E...S.P..L.S..H.I...A...KDAERDF...K.GAW.N.T.E...R.A.T.  
Human : E..PV.Q.H.LKREAG.G.R..A...S.P..NRTQL.N.A.F.P.W.AFKER--K.WVKENMV.N.S.EAS.H.R.T.S.

GSB : TTA--DGKVLDETSREVTDEGVQSTVDVKVTS DITVFCNATNDFGTDALTFDIKATHTTAATTTAETTTTIT-----  
Tilapia : ..S--...N..ALQT.T-ED.A..V.TF...S.K...KV.E...ILN.ILT.I.SMP.I.T..RSTTTI  
Zebrafish : .ITGSQSQSWR.VD.KE.EDR.H.V.T...TVAI..S...IETKI...SIP--FLO.P..RK...-----  
Human : NVN---.TASE.DQDPQVRLSTLNV.VTPELLETG.E.T...L.K.TSILF.ELVNL..LTPD.NT..GLS...-----

GSB : -----TTTSPASTTTISSTTVKPKT-----VNPPKK--KVKKESGGVI IAVIIICILLLAILGSLVLYFLYK  
Tilapia : SNDTVVHTTP...TT..NA..DD..TON.STNYVNDP.QT.T.SPN...K.-F.....A.....  
Zebrafish : -----VDN...V..S.....F.....  
Human : -----ASP.H.RAN...E.KLP-----EP..R...VA.....A.....

GSB : KGK-ICGRSGKQDLTKEKSNKDNIVVEMKSDNT-EEAVLLG-VNGEKQPPNDQ-----  
Tilapia : ...-.....F..R..S.....-.....Q...  
Zebrafish : ...L.....E.....AKK...S...KG...K...NSTLRS--  
Human : ...LP.R...E..LPP.R.SE.....KLP..MG..QGSS.D.RA.G..GEKYIDLRH

## Mucin 19:

GSB : -----FLLLACSKESSDTMTSQRWMLAVWLVLSSVLGTGESVATTQTQKYTCRTFGSGVVQPFNDSVFYV  
Tilapia : -----P.QR..S.CF..V..T-----KGLG...  
Mole rat : -----EKGSHIPEA.PK<sup>Y</sup>SETN-----EIIIGEAS..DR.TYKA..GH..SF  
Cow : GLSGSASVEDELKGFASDASS.GGNIW.SN.GSGEGNKGEAGLGTS.QNV.DE.GV.STGEAS...K.AYKA..GR..SF

GSB : RSNCPFTLT-HPTHNRVECDITTRRGDNGLLVQVEIIINKVRTVLQNGSIQVERKSVSLPYDHTYQHI FHYGIYTKLRSP  
Tilapia : .....-R.....Y...IQ.....T.....L.....Q.....S  
Mole rat : ..S.T..FCR.CVESGGDF..EI..N..-SG.EK.K...SNDIS.L.D..L.NGER.Q...SKLI..KKL.K.NV...R  
Cow : E.S.T..FCR.CVESGGDF..EI..N..SE.EK.T...NNDVS.FGDI.L.NGE..Q...NKLI..KK..EHNV.N.R

GSB : LPPLSVTWHNGPGGIDTLWVELEQELSTDMTGLCGKHNGTGN---QKVVMSV<sup>L</sup>LADDTCQTRDPTSVGSPECGTFFSHTL  
Tilapia : .L.....RSV.....G.....D.A.S.N--Q..T..T.TQE.....VF.TN.V.RK...Y..  
Mole rat : RGI...M.DKN----S.T.HKRYE--C...NF.S.TGQDINEH..N.K.PG.CPSAVSK.YEVCEDGVQ.CNNI.  
Cow : RGI...M.DKN----K.S.T.HK.YP--C...NF.S.PGDDINEH.AD.K.P..CSKAVSK.YEVCEDGVQ.CNKI.

GSB : ECLQARVRQYLDLCEKN-----IYKYEMSKGVTCSEFFKEIVQCCENT-SRVWDIWR--SVTKCDKPCDPCGDLIYVEQGP  
Tilapia : ....V.TPH..Q...A-----F.S..K..Y.G.A...ALH.G.N-.Y..QK...-A...AE.T.....K...D  
Mole rat : GTYFE.CEKVAT.SSGYKTICINE.CQERGE.SS..DT.S..SRL.ASDGPG..ES.LDD.NVT.E..T..EKQ..K.C.L  
Cow : GTYFE.CGKYST.SSDYKMICIDE.CQSRD.TS..DT.S..SRL.ASDGPGT.ES..DDPDVV.E..I..EKH..K.C..

GSB : AFVPSCTNPNRFSNQDYISTCVCPEGKVLNDQADGSHCVSVSSSPCVFAGKSYSTGDMRSTKC-QLCICDSGK<sup>W</sup>RCSN  
Tilapia : .....S..G.AIT.....K.....H.EDL....P.C...S...L....K...-A...G...H...  
Mole rat : SNPA...VA.-.Q.SEC..G.T.S...Y...IGEKGK..LKE.C..ESN..V.NP.E..EGP.GSQ.T.QDA..S..DG  
Cow : SNPA...VA.-.Q.TEC..G.T...Y...IGEKGR..LK.DC..ESN..V.Q..E..EGS.GS..T.QEA..S..KT

GSB : ICPARCVIEGQHVTTFDGKEYVLPKCTYVALQGFNWTIKIEFVKDASLKTVAFLLFQEKYTVSQGVVKIGEBE-----  
Tilapia : S..GG.H...F.....K.....S..L...N...G.H...R..ILQ...M..F.HN...FED.-----  
Mole rat : ...G..K...SLF...DNK.NH..N.H...HNE...S..LRPCPN.QTGTCLNSVTLLNS.VS...YVFNSDGKVT  
Cow : ...G..K...SL...VK.NH..N.H...HDK...S..LRPCPSGQSGTCLNSVTLLNS.VQ..D.YVFNRDGTVT

GSB : -----ITELHQSDNVLVFWQSSMYIHFTSLGMKIEVQMSPEIQLYITPPANHTGMI SGLCGNNNDTDDFTTTSG<sup>I</sup>IE  
Tilapia : -----RA.....EV...F.....G.....  
Mole rat : KDMVR.KDYYY..E.Q..KA..S..QVE.YNH...TV.V...M.P.EFTDTV...SY..KAE...M..QN...  
Cow : NDKFGNLGYYY..K.Q..NA..S..QAE.YFHG...F.V...M.P.QFTDTV...SH..RAE...M..QN...

GSB : NSAQPPAQSWSVGDCAVDIPDTCINKDNEIFADE<sup>K</sup>  
Tilapia : ..P...L...P.TP..P...T.....  
Mole rat : K.S.A..N..E.MP.PKGT.A...SIEK.K..ENN  
Cow : K.S.A..S..E.MP.PKASTA...SIEK.R..ERH