

**Table S1. Transglutaminases used for phylogenetic analysis**

| Species     | Gene  | NCBI GenBank accession number |
|-------------|-------|-------------------------------|
| Human       | TGM1  | NP_000350                     |
| Human       | TGM2  | NP_004604                     |
| Human       | TGM3  | NP_003236                     |
| Human       | TGM4  | NP_003232                     |
| Human       | TGM5  | NP_963925                     |
| Human       | TGM6  | NP_945345                     |
| Human       | TGM7  | NP_443187                     |
| Human       | F13A1 | NP_000120                     |
| Human       | EPB42 | NP_000110                     |
| Mouse       | TGM1  | NP_001155186                  |
| Mouse       | TGM2  | NP_033399                     |
| Mouse       | TGM3  | NP_033400                     |
| Mouse       | TGM4  | NP_808579                     |
| Mouse       | TGM5  | NP_083075                     |
| Mouse       | TGM6  | NP_808394                     |
| Mouse       | TGM7  | NP_001153896                  |
| Mouse       | F13A1 | NP_001159863                  |
| Mouse       | EPB42 | NP_038541                     |
| Zebra finch | TGM1  | XP_041568788                  |
| Zebra finch | TGM2  | XP_002195997                  |
| Zebra finch | TGM3  | XP_030144662                  |
| Zebra finch | TGM4  | XP_041570454                  |
| Zebra finch | TGM6  | XP_041576223                  |
| Zebra finch | TGM5L | XP_030121789                  |
| Zebra finch | F13A1 | XP_002199785                  |
| Zebra finch | EPB42 | XP_030144378                  |
| Chicken     | TGM1  | n.a.                          |
| Chicken     | TGM2  | NP_001378925.1                |
| Chicken     | TGM3  | XP_040544622                  |
| Chicken     | TGM4  | NP_001006368                  |
| Chicken     | TGM5L | XP_015137927                  |
| Chicken     | TGM6  | XP_040544619                  |
| Chicken     | TGM6L | XP_015152172                  |
| Chicken     | F13A1 | NP_990016                     |
| Chicken     | EPB42 | NP_001308488                  |
| Fruit fly   | Tg    | NP_609174.1                   |

n.a., not applicable (sequence determined in this study)



# A

|                        |  |  |
|------------------------|--|--|
|                        | 1  | 100  |
| TGM1 human             | MMDG-PRSDVGRWGNFLQPTTSPPEPEPEPD---GRSRGGGRSFWAACCGCCSCRNAADDDWGPEP6DSRGRGSSSGTRRPGSRGSDSRFPVSRGS       |  |
| TGM1 zebra finch       | MPD--PRLDRGFP--SLRLTGAPRAFPFSGRRAGLWRLAAAGN---CGCCGCCGRSGGGGGGEWEP1PGETPGRRTAQ-----                    |  |
| TGM1 chicken           | MPDADPRLDAGRWAASFRLRGAPSSDPPFRSGSGFWRL---GGC---CGCCGCCRR---GKEDWDFPPGVEVPGRRFPQ-----                   |  |
| SRR13171916.38844678.2 |  |  |
| SRR13171916.4105304.1  | APSSDPPFRSGSGFWRL---GGC---CGCC   |  |
| SRR13171916.22961509.1 |  | CGCCGCCRR---GKEDWDFPPGVEVPGR5              |
| SRR13171916.35134332.1 |  | KEDWDFPPGVEVPGRRFPQ-----                   |
|                        | 101  | 200  |
| TGM1 human             | GVNAAGDGTIREGMLVVNGVDLLSSRSDQNREHHTDEYEYDELIVRRGQPFHMLLLLSRTYE-SSDRITLELLIGNPEVGKGTHTVIIPVKGSGSGWK     |  |
| TGM1 zebra finch       | -----PVRPGLLAPVM---LRPGSSTNRTAHTHQEFAPRLVVRGQRFHVGMRLPRE-PRTDGICILELTLPNPQVAKGTHVLVPLGGSSPTGWS         |  |
| TGM1 chicken           | -----ALKPGLLVPRG---LVVGSRADRIAHTAEFCSPQLVVRGQPFHLRVLLPRFPDPEDDSLCELLLGPTQVAKGTHVLIPLGETSATGWT          |  |
| SRR13171916.35134332.1 | -----ALKP  |  |
| SRR13171916.34579967.1 | -----KPGLLVPRG---LVVGSRADRIAHTAE   |  |
| SRR13171916.34310259.2 |  | GSRADRIAHTAEFCSPQLVVRGQ                    |
| SRR13171916.37813454.2 |  | ADRIAHTAEFCSPQLVVRGQPFH                    |
| SRR13171916.40142191.1 |  | AHTAEFCSPQLVVRGQPFHLRVL                    |
| SRR13171916.36470078.1 |  | HLRVLLPRFPDPEDDSLCELL5                     |
| SRR13171916.32182126.1 |  | PEDDSLCELLLGPTQVAKGTHVL                    |
| SRR13171916.5625680.2  |  | QVAKGTHVLIPLGETSATGWT                      |
| SRR13171916.29113231.2 |  | TGWT                                       |
|                        | 201  | 300  |
| TGM1 human             | AQVVK-----ASGQNLNLRVHTSPNAIIGKFQFTVRTQSDAGEFQLPFPDPNEIYILFNWCPEDIVVVDHEDWRQEVYVLNESGRIYGYTGAQIG        |  |
| TGM1 zebra finch       | AEVDEGVAEPIGGGANSGHALMVGLTAPPTAPIGRYRLSARTRTEAGEFAAPFEPDNLDVLFNFWCQSDSVMEQTSDLSEYVLNESGRIFYGTTEEQIA    |  |
| TGM1 chicken           | AE--EAGEEAEAGEASGSPALRLRLSAPADAPIGRYRLSVKTRTGAGEFGAFPDDRNDVILFNFWCEEDGVYMEQTNLDNLEYVLNETGRIFYGTTEEQIA  |  |
| SRR13171916.5625680.2  | AE--QA   |  |
| SRR13171916.29113231.2 | AE--EAGEEAEAGEASGSPALRL  |  |
| SRR13171916.41732328.2 | EEASGSPALRLRLSAPADAPIGRY   |  |
| SRR13171916.32667632.1 |  | IGRYRLSVKTRTGAGEFGAFPDDRN                  |
| SRR13171916.39039682.1 |  | RTGAGEFGAFPDDRNDVILFNFWC                   |
| SRR13171916.38368388.1 |  | TGAGEFGAFPDDRNDVILFNFWCE                   |
| SRR13171916.42307715.2 |  | RNDVILFNFWCEEDGVYMEQTNLD                   |
| SRR13171916.39820236.1 |  | DGVYMEQTNLDNLEYVLNETGRIFYG                 |
| SRR13171916.38559026.1 |  | YVLNETGRIFYGTTEEQIA                        |
| SRR13171916.26942286.1 |  | VLNETGRIFYGTTEEQIA                         |
| SRR13171916.27909714.2 |  | IA   |
|                        | 301  | 400  |
| TGM1 human             | ERTWNYGQFDHGVLDACLILDRRGMFYGGRGDPVNVSRVISAMVNSLDDNGVLIGNWSGDYSRGTNPASWVGSVEILLSYLRTGYSPYQGCWVFAGVT     |  |
| TGM1 zebra finch       | ERAWNYGQFEPGVLDACLFLDRRGMPHGARGDPVMVARVVSAMVNSLDDSGVLVGNWTGIDYSQGTNPASWAGSVGLRSFHTGSPVRYGQCWVFAGVV     |  |
| TGM1 chicken           | ERSWNYGQFDAGVLDACLAILDRRRMPSARGDPVMVTRVVSAMVNSLDDNGVLVGNWTGIDYTGQTNPASWAGSDILRSYHRGGAPVRYGQCWVFAGVV    |  |
| SRR13171916.38559026.1 | ERSWNYG  |  |
| SRR13171916.26942286.1 | ERSWNYGQ   |  |
| SRR13171916.27909714.2 | ERSWNYGQFDAGVLDACLAILV   |  |
| SRR13171916.41211803.2 | FDAGVLDACLAILDRRRMPSARGD   |  |
| SRR13171916.34827418.1 | GVLDACLAILDRRRMPSARGDPVM   |  |
| SRR13171916.31179310.1 | DACLAILDRRRMPSARGDPVMVTR   |  |
| SRR13171916.25778807.1 |  | MVTRVVSAMVNSLDDNGVLVGNWT5                  |
| SRR13171916.13320237.2 |  | LVGNWTGIDYTGQTNPASWAGSDI6                  |
| SRR13171916.40268579.1 |  | AWAGSDILRSYHRGGAPVRYGQCW                   |
| SRR13171916.42053964.2 |  | LRSYHRGGAPVRYGQCWVFAGVV                    |
| SRR13171916.40167136.1 |  | QCWVFAGVV                                  |
|                        | 401  | 500  |
| TGM1 human             | TTVLRCLGLATRTVTNFSAHDDTDSLTMDDIYFDENMKPLERLNDSVNFWNDWCMMRPDLPSGFDGWQVVDATPQETSSGIFCCGQPCSVESIKNGL      |  |
| TGM1 zebra finch       | TTVLRCLGLPTRTVTNFSAHDDTDSLTTDIDYLEAMRPLERLNTDSVNFWNDWCMMRPDLPEGYDGWQVVDATPQETSSGIFCCGQPCSVKAVKNQD      |  |
| TGM1 chicken           | TTVLRCLGVPTRTVTNFSAHDDTDSLTTDIDYFDENMKPLERLNTDSVNFWNDWCMMRPDLFAGYDGWQVVDATPQETSSGIFCCGQPCSVTAVKNQE     |  |
| SRR13171916.42053964.2 | TT   |  |
| SRR13171916.40167136.1 | TTVLRCLGVPTRTVTN   |  |
| SRR13171916.37216926.2 | VLRLCLGVPTRTVTNFSAHDDTDSL  |  |
| SRR13171916.38999933.1 |  | VSLTTDIDYFDENMKPLERLNTDSVW                 |
| SRR13171916.40911907.2 |  | PLERLNTDSVNFWNDWCMMRP7                     |
| SRR13171916.41474269.1 |  | NFWNDWCMMRPDLFAGYDGWQVV                    |
| SRR13171916.39029076.2 |  | CWMRPDLFAGYDGWQVVDATPQET                   |
| SRR13171916.37760965.2 |  | VDATPQETSSGIFCCGQPCSVAAVN                  |
| SRR13171916.39575733.2 |  | GPCSVTAVKNQE                               |
|                        | 501  | 600  |
| TGM1 human             | YMKYDTPPIFAEVNSDKVYWQRQDQGSFKIVVVEEKAIGTLIVTKAISNMREDITYLYKHPEGSDAERKAVETAAAHGSKFNVYANRGSADVAMQVE      |  |
| TGM1 zebra finch       | YFLKYDTPFVFAEVNSDKVYWQRQAQGFVAVHVEEGAIGRISTGLGATCHARVDITDQYKHPEGSDEERRAVSAATSHGSRPRQRGPTSGGE-VTMTVG    |  |
| TGM1 chicken           | VFLKYDTAFVFAEVNSDKVYWQRKGNGAFAlVHVEEGAIGRISTVGPQSAARIDITHLYKHPEGSEARRAVSTATSHGSRPRSGAAPSRGE-VRLSL6     |  |
| SRR13171916.39575733.2 | VFLKYDTAFVFAE  |  |
| SRR13171916.38474934.1 | TAFVFAEVNSDKVYWQRKGNGAFAl  |  |
| SRR13171916.2755541.2  | VNSDKVYWQRKGNGAFAlVHVEEGA  |  |
| SRR13171916.38203596.2 | DKVYWQRKGNGAFAlVHVEEGAIGR  |  |
| SRR13171916.35142.1    |  | GRISTVGPQSAARIDITHLYKHPE                   |
| SRR13171916.36952746.2 |  | IDITHLYKHPEGSEARRAVSTATS                   |
| SRR13171916.40442065.1 |  | EARRAVSTATSHGSRPRSGAAP8                    |
| SRR13171916.36501675.1 |  | APSRGE-VRLSL6                              |
|                        | 601  | 700  |
| TGM1 human             | AQDVMGQDLMVSMVLINHSSSRRTVKLHLYLSVTFTYTGSGTIFPKETKKEVELAPGASDRVTMPVAYKEYRPHLVDQGAMLNVSHGVKESQGLAKQH     |  |
| TGM1 zebra finch       | SGPAVAGADLELRAVLKNGGLEPRTLRLRFSLCVARYTGVAGAAFQEQHRTLPFGQEDTVMTMTVITYTTEYQPHVGDQDALKLRTAAAVQESQGLAKEL   |  |
| TGM1 chicken           | SGPAVAGAELELKVTAHNAAPQPRTVRVLVSVLCALRYTGVAAPFPRHEQHRRVAVPQGGEEQLCVAVFFSEYSPHVSGQDALRLRTAAAVVEETGEVVAKE |  |
| SRR13171916.36501675.1 | SGPAVAGAELELK  |  |
| SRR13171916.42107183.1 | VAGAELELKVTAHNAAPQPRTVRVR  |  |
| SRR13171916.40967521.1 |  | RVRLSVLCALRYTGVAAPFPRHEQHR                 |
| SRR13171916.42145422.2 |  | CALRYTGVAAPFPRHEQHRRVAVPQ                  |
| SRR13171916.37909467.2 |  | HRRVAVPQGGEEQLCVAVFFSEYSPH                 |
| SRR13171916.38874248.2 |  | EQLCVAVFFSEYSPHVSGQDALRLT                  |
| SRR13171916.34832449.1 |  | CVAVFFSEYSPHVSGQDALRLTAA                   |
| SRR13171916.29430382.2 |  | SQDALRLTAAAVVEETGEVVAKE                    |
| SRR13171916.19625563.2 |  | KEL  |
|                        | 701  | 800  |
| TGM1 human             | TFRLRTPDLSLTLLGAADVQGECEVQIVFKNPLPVTLTNVVFRLESGSLQRPKILNVGDIGGNETVTLRQSFVFPVRPGRQLIASLDSQLSQVHGVIQV    |  |
| TGM1 zebra finch       | LVRLHTPELTLTLGPAVVGRFPVSQVVFQNPPLAPLPSASLMEGAGIACPKPLALGSLGAGQTLRLSQSVTPLRAGQRLVATLESAAPLPSGCVQF       |  |
| TGM1 chicken           | RVRLAAPDLSMTLLGPPVVQGEVSVQVLFERNPLPQKLTAELRMEGAGLSCPASISVGTVAPEQTLRLRQFVVPLRAGRRRLVAAMESAQLGPVHGELOF   |  |
| SRR13171916.29430382.2 | R  |  |
| SRR13171916.19625563.2 | RVRLAAPDLSMTLLGPPVVQGE   |  |
| SRR13171916.41578201.2 |  | GQEVSVQVLFERNPLPQKLTAELRM                  |
| SRR13171916.17212336.1 |  | NPLPQKLTAELRMEGAGLSCPASI                   |
| SRR13171916.34935769.1 |  | GAGLSCPASISVGTVAPEQTLRLRQ                  |
| SRR13171916.37698911.1 |  | TLRLRQFVVPLRAGRRRLVAAMESA                  |
| SRR13171916.38756346.1 |  | VAAMESAQLGPVHGELOF                         |
| SRR13171916.41251451.1 |  | VHGELOF                                    |
| JAENSL010000336.1-part |  | TVAPEQTLRLRQFVVPLRAGRRRLVAAMESAQLGPVHGELOF |
|                        | 801  | 849  |
| TGM1 human             | DVAPAPGDGGFFSDAGDSHLGETIPMASRGA-----   |  |
| TGM1 zebra finch       | SAQT--GSGTSGSLTGDGTGREENHTGSGTNGRRRLRRRRRPGGSGTG   |  |
| TGM1 chicken           | DAVP--GPDGD--SVEGSAATNGNTRRRRRGGGGR--RRGGRAGSGTG   |  |
| SRR13171916.38756346.1 | DAVP--GPD  |  |
| SRR13171916.41251451.1 | DAVP--GPDGD--SVEGSAATN   |  |
| SRR13171916.26215572.1 | DAVP--GPDGD--SVEGSAATNGNTRRRR  |  |
| JAENSL010000336.1-part | DAVP--GPDGD--SVEGSAATNGNTRRRRRGGGGR--RRGGRAGSGTG   |  |

## B

```
>Gallus gallus TGM1 mRNA (coding sequence)
atgccggacgcggaacccccggctggacgcgggccgttgggtgctgcccagcttccgcctgcggggggcgccgtcctccgaccc
cccccgaggtcgcggggtccttctggcgccgcctgggtggctgctgcgggtgctgcgggtgctgcgggcgaggaaggag
attgggacccccccaggagaggtgcccgggacggagacccccccaggctttgaaacccggcctgctggtcccccggggtctg
gttgtgggttcgagggcgacggcatcgcccaccacacggccgagttctgctccccacagctggtggtccgcccgggggagcc
cttccacctccgggtcctcctccacggcccttcgaccccgaggacgacagcctctgcgtggagctgctgctgggccccaccc
cccaggtggccaaaggcactcacgtgctgatcccatggggcgaaacgtcggccaccggatggacggcgaggaggcgaggag
gaagcggaaggggagggagggcgagcggaagtcccgccctccgggtccgcctctcgccccggcgagcgtcccatgggtcggt
ccgctgagcgtcaaaacccggacgggagcgggggaggttcggggcgccctttgatgaccgcaatgacgtcatcgtgctgttca
accctggtgtgaggaggtgggtgtacatggagcaaaactaacgacctaatgagtagctccttaacgagacgggcccgcac
ttctatggcacggaggaacagatcgagagcgctcctggaactacgggcagtttgacgcaggggtcctggatgcctgcttggc
cataatggacggcgccggatgccccacagcgccaggggggaccccgatggtgaccagagtggtgctcgccatggttaaact
ccctggatgacaacgggttctggttgggaactggaccggggattacacgcagggcaccaaccgctcgccctgggcccggctcg
gtggacatcctgcgctcctaccaccgcgggggggcgccggtgcgctacgggcagtgctgggtgttcgcccggcgttgtcaccac
cgtgctgcgctgctgggggtgcccacgcggacgggtgacgaactacaactcggcgccacgacacggacgtgctgcgtgaccaccg
acatctacttcgacgagaacatgaagccctcgagcgctcaacaccgactccgtctggaacttccacgtgtggaacgactgc
tggatgcgcgcggccggacctccctgcgggatacgacggctggcaggtggtggacgccaccccgaggagaccagcagcgggct
gttctgctgtgggcccgtgctccgtgacggccgtgaagaacggggaggtcttctcctcaaatacgacactgccttcgtcttcgccg
aggtaacagcgacaaggtgtactggcagcggaagggaacgggccttcgccatcgtccacgtggaggaaggcgccatcggg
cgccgcatcagcacctggggcccgagtcggccgcccgcacatcacacacccctacaaacaccccgagggctcgaggcg
ggagcgtcgcgcggtgtccacggcgacatctcacggctcccgccctcgacggcgcgcgccgctcccggggggaggtgcggc
tgtcgtgagctccgggcccgggtggcgggggcgagttggagctgaaagtacgggtcacaacgcggctccgcagcccgcg
accgtccgggtgcggctgtccgtctgcgcgtgcggtacaccggagtgccggcgccgccttcgccacgagcagcacaggag
ggtcgtggcgccggggggggaggagcagctgtgtgtggcggtgccgttctcgagtagacagccccacgtgggctctcaggacg
cgctccgtctgacggcgggcgggcggtggaggagacgggggaggtggtggccaaagagctgcgcgtccgcctggcgggcccc
gacctcagcatgacgtgctgggcccccggtttagggcaggaggttccggtcaggtcctcttcgggaatccgctgccccca
gaagctcacggggggcgagcttcgcatggagggggcggggctgtcctgccccgcacatccatcagcgtcggcacgggtggcccccg
agcagacctgcggctccgtcagcccggtggtgcctctcggggcccggcgccgtcggttgggtggccgcatggaaagcgcccag
ttgggccccgtccacggagagctgcaattcgacgccgtcccgggacccgacggggacagcgtggagggcagcgcggaaccaa
cggcaacacgaggagggaggagggggggagggggcgggcgccggggggggagggcgggggggagcaccgggggggtga
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## C

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>Gallus gallus TGM1
MPDADPRLDAGRWAASFRLRGAPSSDPPPRSRSFSWRLGGCCGCCGCCRRGKEDWDPPPGEVPGRRPPQALKPGLLVPRGL
VVGSRADRIAHTAEFCSPQLVVRGQPFHLRVLLPRFPDPEDDSLCEVLLLGPTPQVAKGTHVLIPLGETSATGWTAEEAGE
EAEEGEASGSPALRLRLSAPADAPIGRYRLSVKTRTGAGEFGAPFDDRNDVIVLFNFWCEEDGVYMEQTNDLNEYVLNETGRI
FYGTTEEQIAERSWNYGQFDAGVLDACLAAILDRRRMPHSARGDPMVTRVVSAMVNSLDDNGVLVGNWTGDYTGQTNPSAWAGS
VDILRSYHRGGAPVRYGQCWVFAGVVTTLRLCLGVPTRTVTNYSNAHDTDVSLTTDIYFDENMKPLERLNTDSVWNFHVWNC
WMRRPDLPAGYDGVVQVVDATPQETSSGLFCCGPCSVTAVKNGEVFLKYDTAFVFAEVNSDKVYWQRKNGAFAIVHVEEGAIG
RRISTVGPQSAARIDITHLYKHPEGSEAEERRAVSTATSHGSRPRSAGAAPSARGEVRLSLSSGPAVAGAELELKVTAHNAAPQPR
TVRVRLSVCALRYTGVAAPPFRHEQHRRVVAPGGEQLCVAVPFSEYSPHVGSQDALRLTAAAVEETGEVVAKELRVRLAAP
DLSMTLLGPPVVGQEVSVQVLFNPLPQKLTGAELRMEGAGLSCPASISVGTVAPEQTLRLRQPVVPLRAGRRRLVAAMESAQ
LGPVHGELQFDAVPDGDSDVEGSAATNGNTRRRRRGGGRRRGGRAGGSTGG
```

**Figure S1. Chicken TGM1 sequence assembly. (A)** Alignment of amino acid sequences of TGM1 proteins of human and zebra finch versus translated sequences of chicken TGM1 nucleotide sequence fragments. RNA-sequencing reads from chicken in vitro skin models were subjected to tBLASTn search for TGM1. The sequences of the RNA-seq reads are shown in Supplementary Table S1. **(B)** Nucleotide sequence of the coding region of chicken (*Gallus gallus*) TGM1 mRNA. **(C)** Amino acid sequence of chicken (*Gallus gallus*) TGM1 protein.

>mouse\_TGM1

LVVTGVDLLCDQNRREHHTDEFEYDELIVRRGQPFHMILFLNREYESSDRIALELLIGSNP  
EVGKGTHV IIPVGKGGSGGWKAQVTKNNGHNLNLRVHTSPNAIIIGKFQFTVRTRSELPFDP  
RNEIYILFNPWCPEDIVYVDHEDWRQEYVLNYESGRIYYGTEAQIGERTWNYGQFDHGVLDA  
CLYILDRRGMPYGGRGDPVSVSRVVSAMVNSLDDNGVLIGNWTGDYSRGTNPASAVGVSVEI  
LLSYLRTGYSVPYGCWVFAGVTTTVLRCLGFATRITVTFNSAHDTDTSLTMDIYFDENMK  
PLHLNHDVWNFHVWVNDWCWMKRPDLPSGFDGWQVVDATPQETSSGIFCCGPCSVEVSKNGL  
VYMKYDTPFIFAEVNSDKVYWQRQDDGSFKIVYVEEKAIGTLIVTKAIHSNNREDITHIYK  
HPEGSEAERRAVEKAAAHGSKPNVYATRDSAEDVAMQVEAQDAVMGQDLAVSVVLTNRGSS  
RRTVKLHLYLCVTYYTGVSGPTFKEAKKEVTLAPGASDSVTMPVAYKEYKPHLVDQGAMLL  
NVSGHVESGQVLAKQHTFRLRTPDLSTLLGAAVVGQECGVQIVFKNPLPVTLTNVVRLE  
GSGLRPKVLNVGDIGNETVTTLRQTFVPVRPGPRQLIASLDSPLSQVHGVIVQVDVAP

>mouse\_TGM2

LLLERCDLEIQANGRDHHTADLCQEKLVLRRGQRFRLTLYFGRGYEASDSLTFGAVTGPDP  
SEEAGTKARFSLSDVEEGSWSASVLDQQDNVLSLQLCTPANAPIGLYRLSLEASTGGSSFV  
LGHFILLYNWCPADDVYLDSEERREYVLTQQGFIYQGSVKFIKSVPWNFQGFEDGILDT  
CLMLLDMNSRDCSRSSPIYVGRVVSAMVNCNDDQGVLLGRWDNNYGDGISPMAWIGSVDI  
LRRWKEHGQQVKYGCWVFVAAVACTVLRCLGIPTRVVTNYSNHAHDQNSNLLIEYFRNEFGE  
LESNKSEMIWNFHCWVESWMTRPDLQPGYEGWQAIDPTPQEKSEGTYCCGPVSVRAIKEGD  
LSTKYDAPFVFAEVNADVVDWIRQEDGSVLKSINRSLVVGQKISTKSVGRDDREDITHYK  
YPEGSPEEREVFTKANHLNKLAE-----

KEETGVAMRIRGDSMSGNDFDVFAHIGNDTSETRECRLLLCARTVSYNGVLGPECTED-  
INLTLDPYSENSIPLRILYKEYSGCLTESNLIKVRGLLIEAANSYLLAERDLYLENPEIKI  
RVLGEPKQNRKLVAEVS LKNPLSDPLYDCIFTVEGAGLTKQKSVEVSDVPAGDLVKARVDL  
FPTDIGLHKLNVNFQCDKLSVKGYRNVIIIGP

>mouse\_TGM3

LQIQNVNWQVPMNRRAHHTDKFSSQDSIVRRGQPWEIILVCNRSLESGEDLNFIVSTGPPQ  
SESARTKAVFSISGRSTGGWNAALKANSNNLAIAIASPVSAPIGLYTLVSEISSRASSLK  
LGTIFIMLFNPWLQADDVFMSNHAERQEYVEEDSGIIYVGSTNRIGMVGWNFGQFEEDILNI  
SLSILDRSVTDVARRNDPKYVCRVLSAMINGNDDNGVISGNWSGNYTGGVDPRTWNGSVEI  
LKNWKKSGRPVQFGQCWVFAGTLNTVLRCLGVPSRVITNFNSAHDTDRLNSVDVYYDAMGN  
PLEKGSDSVWNFHVWNEGWFVRTDLGPTYNGWQVLDATPQERSQGVFQCGPASVNAIKAGD  
VDRNFDIMFIFAEVNADRITWIYNNRNTQKQNSVDTHSIGKYISTKAVGSNSRMDVTDKYK  
YPEGSSEERQVHQKALDKLPNASFGAEDKEPSISGKFKTGILAVGKEVSLSLMLKNMTND  
RKTVTMNMATAWTIVYNGTLVHEVWKDSATISLDPEEEIQYPVKIAYSQYERYLKADNMIRI  
TAVCKVPDEAEVVVERDVILDNPALTLEVLEQAHVRKPVNVQMLFSNPLDQPVNNCVLLVE  
GSGLLRSLKIDVPSLRPKEKSRIRFEIFPTRSGTKQLLADFS CNKFP AIKAMPLIDVSE

>mouse\_TGM4

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>chicken\_TGM2

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>chicken\_TGM3

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>chicken\_TGM4

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>chicken\_TGM6

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>chicken\_TGM6L

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>human\_TGM3

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>human\_TGM4

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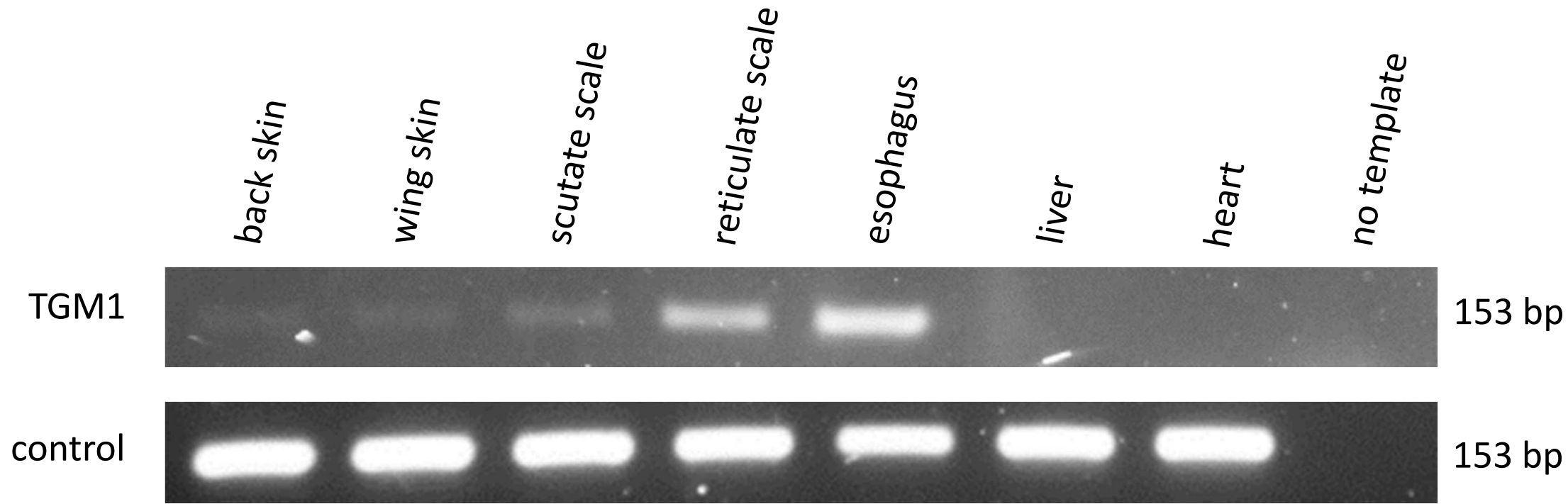
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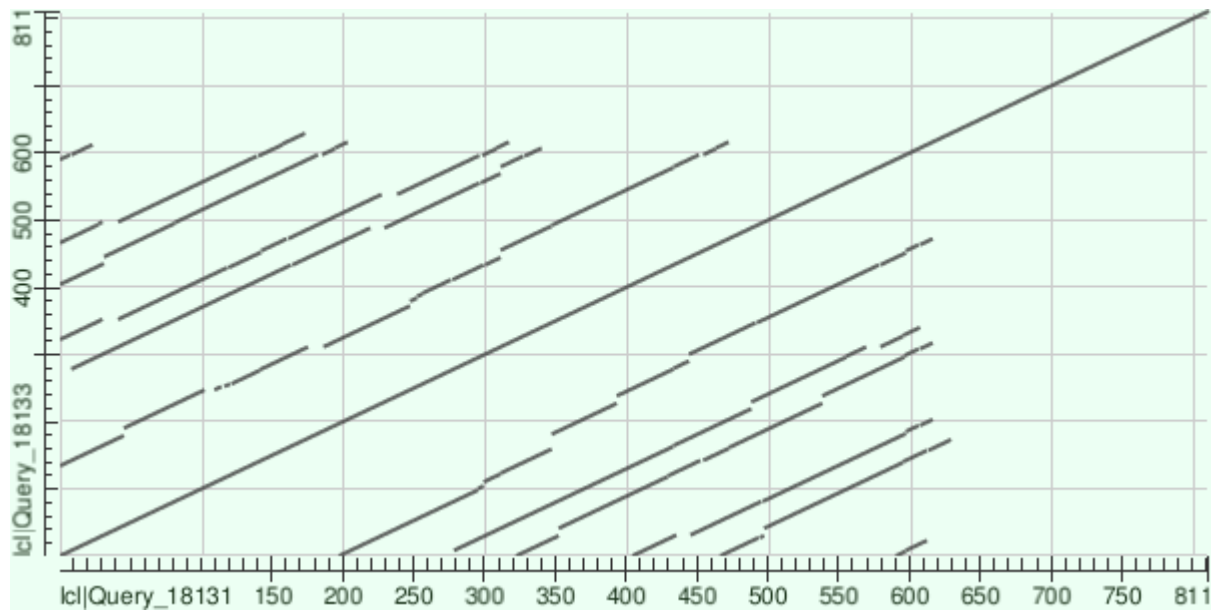
**Figure S2. Alignment of trimmed amino acid sequence of transglutaminases used for the phylogenetic analysis.** The multiple sequence alignment is shown in fasta\_aln format. Sequence regions that could not be aligned unambiguously were removed. GenBank accession numbers are listed in Table S1.



**Figure S3. Expression of zebra finch *TGM1* in selected tissues.** RNA from the indicated tissues and cultured cells was subjected to RT-PCR with primers specific for *TGM1* and the house-keeping gene *EEF1A1* (control). PCR products were analyzed by agarose gel electrophoresis, revealing bands that correspond to the predicted size of the PCR products. *TGM1* is expressed, to a small extent, in the skin (back skin and wing skin), and skin appendages (scutate scale and reticulate scale) of the zebra finch. The strongest expression of *TGM1* was detected in the esophagus. *TGM1* is not expressed in the liver or the heart.

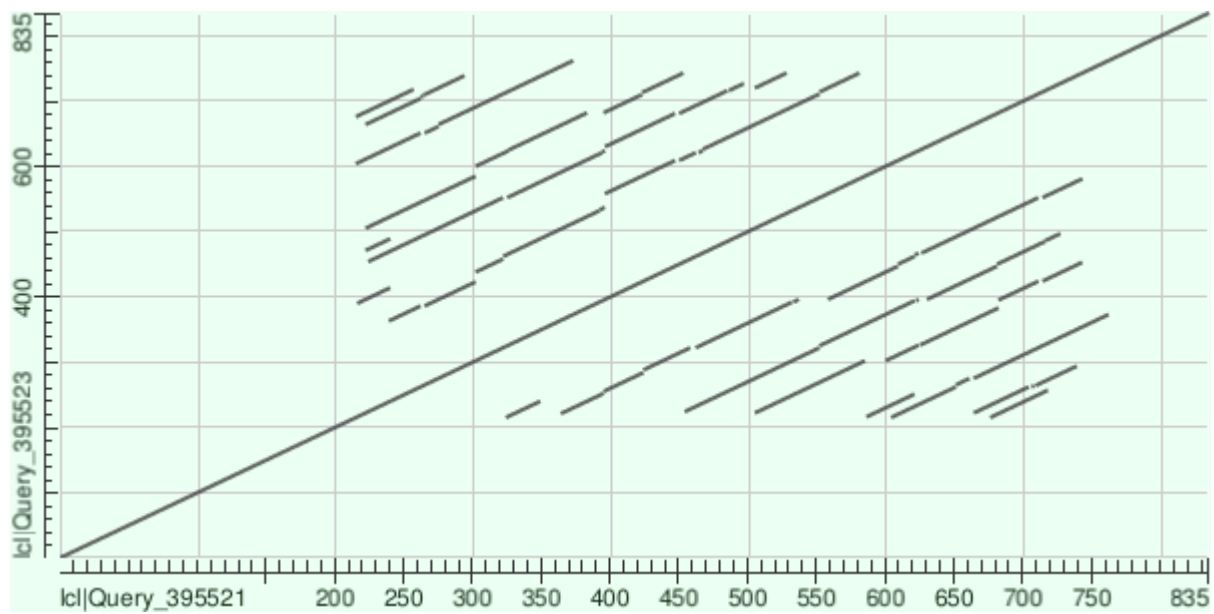
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# B

Chicken *TGM1*, last intron, GenBank accession number JAENSL010000336.1, nucleotides 958-1783



[illegible]

Figure S4, page 3



Figure S4, page 4

Figure S4, page 5

Figure S4, page 6

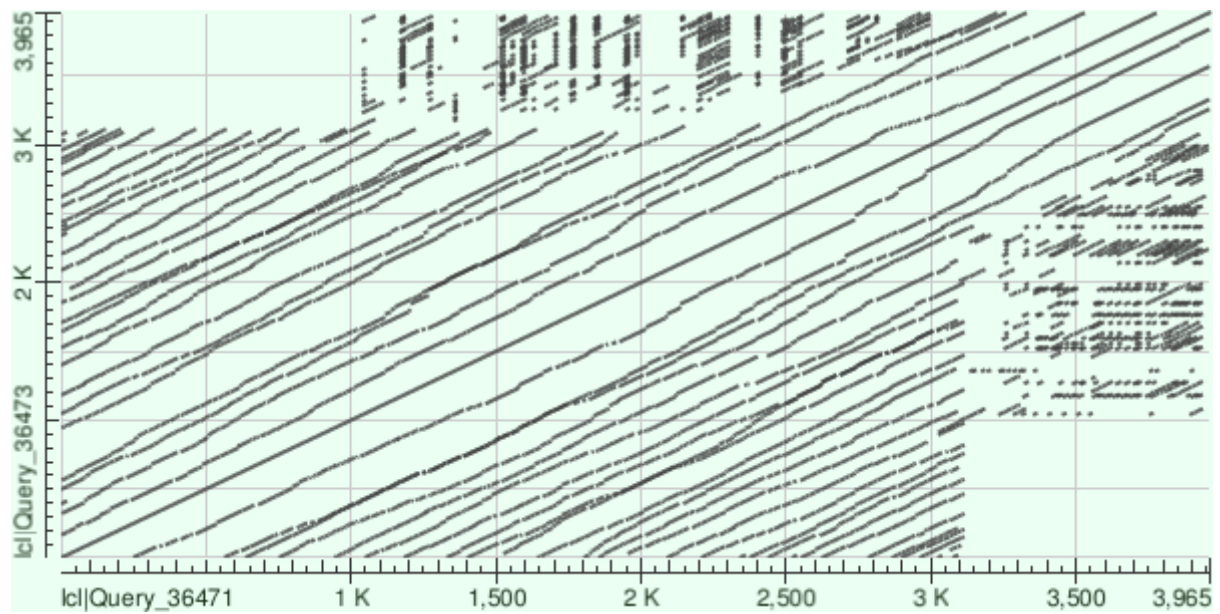
Figure S4, page 7

D

Figure S4, page 8

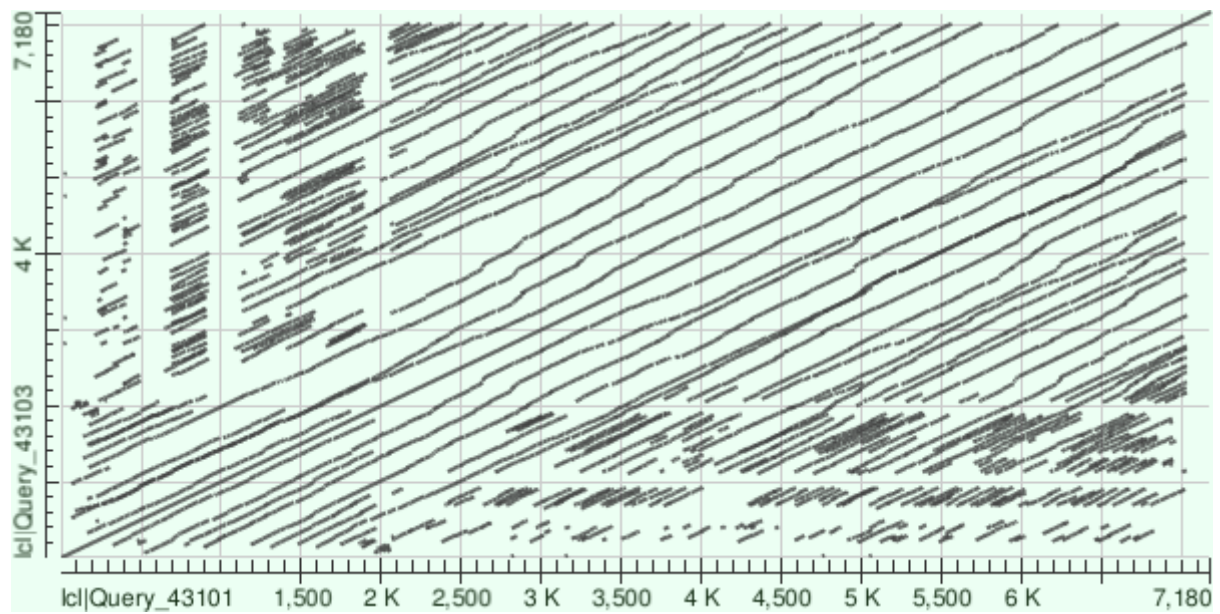
# E

Dot plot: Zebrafinch *TGM1* intron 1 vs. zebrafinch *TGM1* intron 1



# F

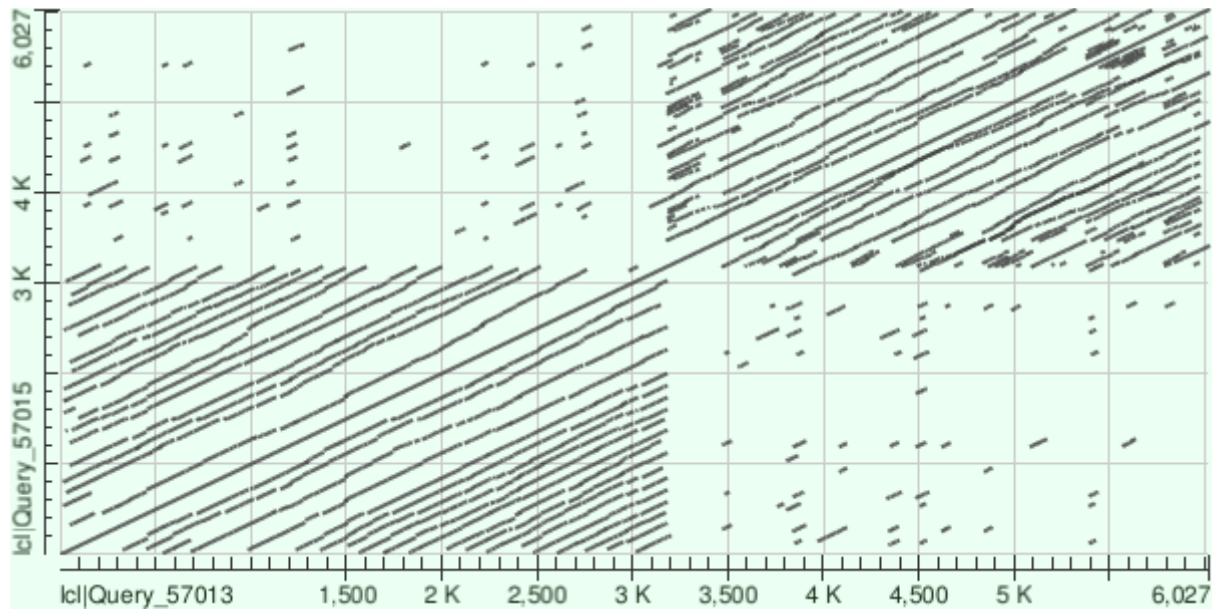
Dot plot: Zebrafinch *TGM1* intron 2 vs. zebrafinch *TGM1* intron 2





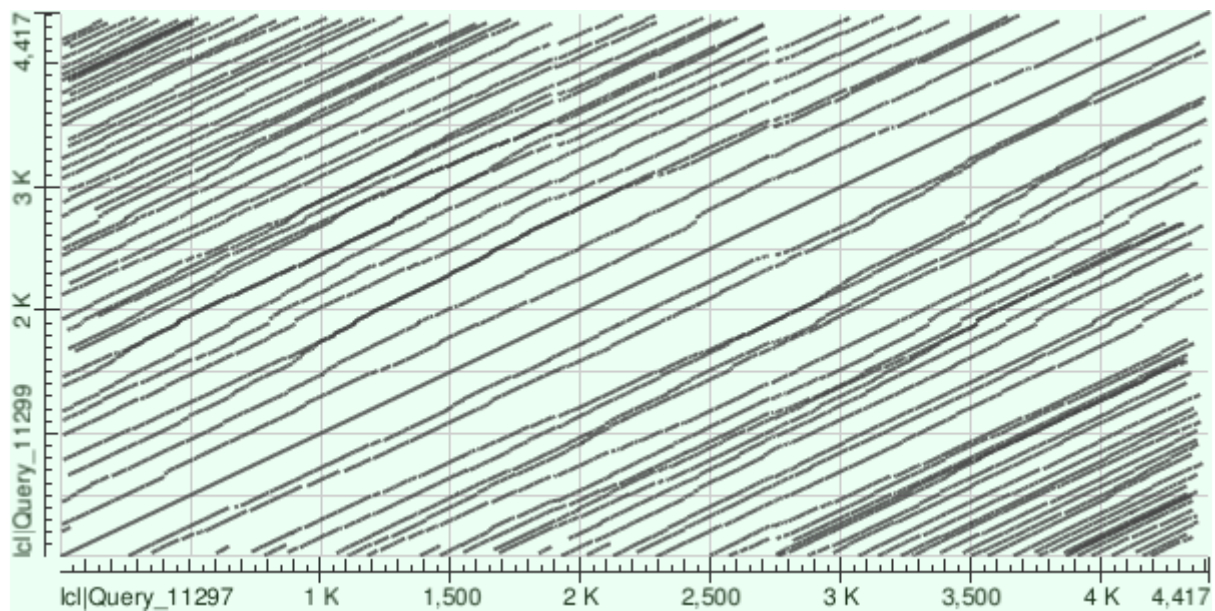
# G

Dot plot: Zebrafinch *TGM1* intron 3 vs. zebrafinch *TGM1* intron 3



# H

Dot plot: Zebrafinch *TGM1* intron 4 vs. zebrafinch *TGM1* intron 4



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[illegible]



J

A scatter plot showing the relationship between  $\log(\text{Query\_cardinality})$  (x-axis) and  $\log(\text{Join\_cardinality})$  (y-axis) for the 'log' model. The x-axis ranges from approximately 3.5 to 13.1, with major ticks at 4 K, 6 K, 8 K, and 10 K. The y-axis ranges from approximately 3.5 to 13.1, with major ticks at 10 K and 13,117. A solid black line represents the linear fit. Three data points are plotted as black dots. The first point is on the line at approximately (3.8, 4.5). The second point is slightly above the line at approximately (4.2, 5.2). The third point is significantly below the line at approximately (4.0, 4.2).

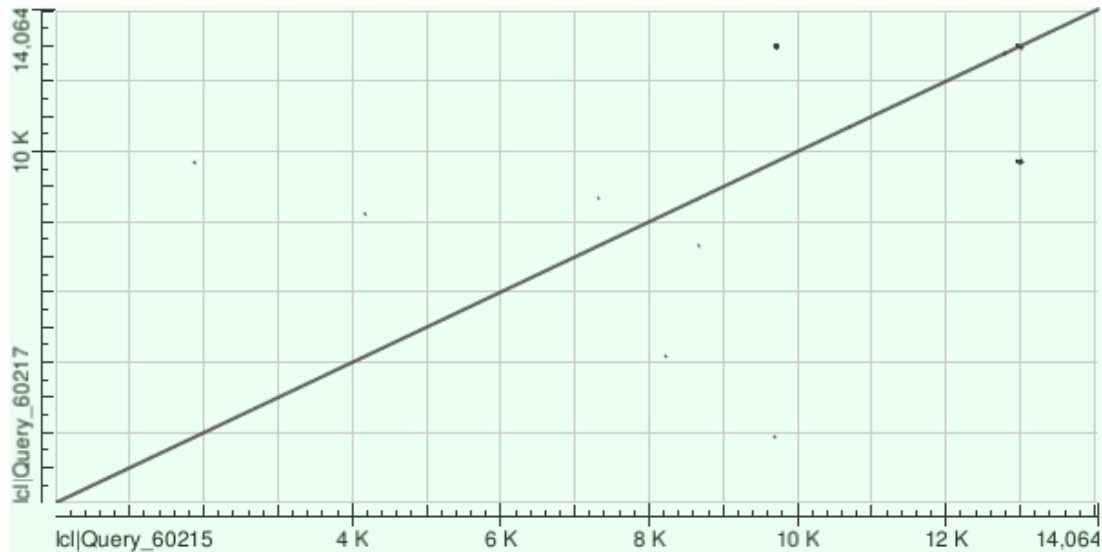
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Figure S4, page 14

**L**

Dot plot: Human *TGM1* vs. human *TGM1*



**Figure S4. Dot plot analysis of chicken *TGM1* introns and zebra finch *TGM1* in comparison to zebra finch *TGM2* and human *TGM1*.** To visualize sequence repeats, the nucleotide sequences of the last-but-one **(A)** and last **(B)** intron of chicken *TGM1* (accession numbers provided in the figure) were subjected to dot plot analysis using the NCBI BLASTn tool using default parameters (Word size 11; Expect value 0.05; Match/mismatch scores 2,-3, Gap costs 5,2; Filter string F; Genetic code 1; Karlin-Altschul statistics: Lambda 0.633731, 0.625; K 0.408146, 0.41; H 0.912438, 0.78). The dot matrix view shows regions of sequence similarity based upon the BLAST results. The same sequences were used as query (X-axis) and subject (Y-axis). Numbers represent nucleotides. Alignments are shown as lines. Plus strand matches are slanted from the bottom left to the upper right corner, and minus strand matches are slanted from the upper left to the lower right. The number of lines shown in the plot is identical to the number of alignments found by BLASTn. Nucleotide sequences of zebra finch *TGM1* **(C)**, zebra finch *TGM2* **(I)** and human *TGM1* **(K)** are shown in FASTA format with color-coded nucleotides. The nucleotide sequences of zebra finch *TGM1* **(D)**, zebra finch *TGM2* **(J)** and human *TGM1* **(L)** and the sequences of zebra finch *TGM1* intron 1 **(E)**, intron 2 **(F)**, intron 3 **(G)** and intron 4 **(H)** were subjected to dot plot analysis. K, kilo (1000).