

Figure S1. Sequence alignment of a hemoglobin alpha subunit. Tyrosine C7 (Tyr 42, human) is highly conserved.

P69905	MVLSPADKTNVKAAWGKVGAGHAGEYGAELERMFLSFPTTKTYFPHF-DLSHGSAQVKGH	59	
P69907	MVLSPADKTNVKAAWGKVGAGHAGEYGAELERMFLSFPTTKTYFPHF-DLSHGSAQVKGH	59	
P01958	MVLSAADKTNVKAAWSKVGGHAGEYGAELERMFLGFPTTKTYFPHF-DLSHGSAQVKAH	59	
P01965	-VLSAADKANVKAAWGKVGQAGAHGAEALERMFLGFPTTKTYFPHF-NLSHGSDQVKAH	58	
P01966	MVLSAADKGNVKAAWGKVGGHAAEYGAELERMFLSFPTTKTYFPHF-DLSHGSAQVKGH	59	
P01945	-VLSAKDKTNI SEAWGKIGGHAGEYGAELERMFLVYPTTKTYFPHF-DVSHGSAQVKGH	58	
P01994	MVLSAADKNNVKGIFTKIAGHAEYGAETLERMFTTYPPTTKTYFPHF-DLSHGSAQIKGH	59	
P83135	MVLTAGDKANVKTVWSKVGSHLEEYGSSETLERLFIYVPTTKTYFPHF-DLHHDASAQVRAH	59	
P01999	MVLSMEDKSNVKAIWGKASGHLEEYGAELERMFCAYPQTKTYFPHF-DMSHNSAQIRAH	59	
P02018	-SLSDKDAVVKALWAKIGSRADEIGAEALGRMLTVYPQTKTYFSHWSDLSPGSGPVKKH	59	
Q1AGS9	MSLSAKDKATVKDFFGKMSTRSDDIGAEALSRLVAVYPQTKSYFAHWKSASPGSAPVRKH	60	
P14522	-VLSAADKTNVKSASFSGIGQADEYGAETLERMFATYPQTKTYFPHF-DLGKGSQVKAH	58	
P07408	-VLSAADKTAIKHLTGSLRNTAEAWGAESLARMFATTPSTKTYFSKFTDFSSANGKRKVAH	59	
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P69905	GKKVADALTNVAHVDDMPNALSALSDDLHAHKLRVDPVNFKLLSHCLLVTLAAHLPAEFT	119	
P69907	GKKVADALTNVAHVDDMPNALSALSDDLHAHKLRVDPVNFKLLSHCLLVTLAAHLPAEFT	119	
P01958	GKKVGDALTLAVGHLLDDLPGALSANLSDLHAHKLRVDPVNFKLLSHCLLVTLAVHLPNDF	119	
P01965	GQKVADALTKAVGHLLDDLPGALSANLSDLHAHKLRVDPVNFKLLSHCLLVTLAAHHPDDFN	118	
P01966	GAKVAAALTKAVEHLDDLPGALSELSDLHAHKLRVDPVNFKLLSHLLVTLASHLPDFT	119	
P01945	GKKVADALTNVGHLLDDLPGALSALSDDLHAHKLRVDPVNFKLLSHCLLVTLANHHPADF	118	
P01994	GKKVVAALIEAANHIDDIAGTSLKLSDDLHAHKLRVDPVNFKLLGQCFLVVAIHHPAALT	119	
P83135	GRKVLASLGEAVNHIDDI PGALSLSLHAQTLRVDVNFKLLNLCFVVVVGRHHPITILT	119	
P01999	GKKVFSALHEAVNHIDDLPGALCRSELHAHSLRVDVNFKFLAHCVLVVFVFAIHHPALS	119	
P02018	GKTIMGAVGDAVSKIDDLVGLSALSSELHAFKLRIDPANFKILAHNVI VVIGMLFPGDFT	119	
Q1AGS9	GITIMGGVYDAVGKIDDLKAGLLSLSSELHAFMLRVDVNFKLLAHCMLVCMVMVFPEEFT	120	
P14522	GKKVAAALVEAANA VDDIAGALSLSLHAQTLRVDVNFKLLGQCFLVTVATHNPSLLT	118	
P07408	GGKVLNAVADATDHLDNVAGHLDP LAVLHGTTLCVDPHNFP LLTQCILVTLAAHL-TELK	118	
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P69905	PAVHASLDKFLASVSTVLTISKYR	142	
P69907	PAVHASLDKFLASVSTVLTISKYR	142	
P01958	PAVHASLDKFLSSVSTVLTISKYR	142	
P01965	PSVHASLDKFLANVSTVLTISKYR	141	
P01966	PAVHASLDKFLANVSTVLTISKYR	142	
P01945	PAVHASLDKFFASVSTVLTISKYR	141	
P01994	PEVHASLDKFLCAVGTVLTAKYR	142	
P83135	PEVHVS LDKFLSAVATALTSKYR	142	
P01999	PEIHASLDKFLCAVSAVLTISKYR	142	
P02018	PEVHMSVDKFFQNLALALSEKYR	142	
Q1AGS9	PQVHVAVDKFLAQLALALCEKYR	143	
P14522	PEVHASLDKFLCAVGTVLTAKYR	141	
P07408	PETHCALDKFLCEVATALGSHYR	141	
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P69905	HBA_HUMAN	Homo sapiens (Human)	Hemoglobin alpha chain
P69907	HBA_PANTR	Pan troglodytes (Chimpanzee)	Hemoglobin alpha chain
P01958	HBA_HORSE	Equus caballus (Horse)	Hemoglobin alpha chain
P01965	HBA_PIG	Sus scrofa (Pig)	Hemoglobin alpha chain
P01966	HBA_BOVIN	Bos taurus (Bovine)	Hemoglobin alpha chain
P01945	HBA_MESAU	Mesocricetus auratus (Golden hamster)	Hemoglobin alpha chain
P01994	HBA_CHICK	Gallus gallus (Chicken)	Hemoglobin alpha-A chain
P14522	HBA_TURME	Turdus merula (Blackbird)	Hemoglobin alpha-A chain
P83135	HBAA_GEONI	Geochelone nigra (Galapagos giant tortoise)	Hemoglobin alpha-A chain
P01999	HBA_ALLMI	Alligator mississippiensis (American alligator)	Hemoglobin alpha chain
P02018	HBA_CARAU	Carassius auratus (Goldfish)	Hemoglobin alpha chain
Q1AGS9	HBAI_BORSA	Boreogadus saida (Polar cod)	Hemoglobin alpha-1 chain
P07408	HBA_SQUAC	Squalus acanthias (Spiny dogfish)	Hemoglobin alpha chain

Figure S2. Sequence alignment of a hemoglobin beta subunit. Phenylalanine C7 (Phe 41, human) is largely conserved throughout mammals and birds, but is a tyrosine in amphibians and fish, whilst split between tyrosine and phenylalanine in reptiles.

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P68871      MVHLTPEEKSAVTALWGKVNVEVGGGALGRLLVVPWTQRFFESFGDLSTPDAVMGNPK 60
P68873      MVHLTPEEKSAVTALWGKVNVEVGGGALGRLLVVPWTQRFFESFGDLSTPDAVMGNPK 60
P02062      -VQLSGEEKAAVLALWDKVNVEEVGGGALGRLLVVPWTQRFFDSFGDLSPGAVMGNPK 59
P02067      MVHLSAEKEAVALGLWGKVNVEVGGGALGRLLVVPWTQRFFESFGDLSTADAVMGNPK 60
P02070      --MLTAEKAAVTAFWGKVKVDEVGGGALGRLLVVPWTQRFFESFGDLSTADAVMNNPK 58
P02094      MVHLTDAEKALVTGLWGKVNADAVGAEALGRLLVVPWTQRFFEFHFGDLSSASAVMNNPQ 60
P02112      MVHWTAEKQLITGLWGKVNVAECGAEALRLLIVYPWTQRFFASFGNLSSTAILGNPK 60
P14524      -VQWTAEEKQLITGLWGKVNVAECGAEALRLLIVYPWTQRFFASFGNLSSTAVLGNPK 59
P83123      MVHWTPEEKQYITSLWAKVNVEEVGGGALRLLIVYPWTQRFFSFGNLSASAILHNAK 60
P02130      -ASFDAHERKFIIVDLWAKVDVAQCADALSRMLIVYPWKRRYFEHFGKMCNAHDILHNSK 59
P02140      -VEWTDAAERSAIITGLWGKLNPDDELGPQALARCLIVYPWTQRFFATFGNLSSPAAILGNPK 59
Q1AGS7      MVEWTATERTHIEAIWSKIDIDVCGPLALQRCLIVYPWTQRFFGSGFDLSTDAIVGNPK 60
P07409      -VHWTGEEKALVNAVWTKTDHQAVVAKALERLFFVVPWTKTYFVKFNGKPHAS----DST 55
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P68871      VKAHGKKVLGAFSDGLAHLNLDKGTFAATLSELHCDKLVDPENFRLLGNVLCVLAHHFG 120
P68873      VKAHGKKVLGAFSDGLAHLNLDKGTFAATLSELHCDKLVDPENFRLLGNVLCVLAHHFG 120
P02062      VKAHGKKVLHSPFEGVHLLDNLKGTFAALSELHCDKLVDPENFRLLGNVLCVLAHHFG 119
P02067      VKAHGKKVLQSFSDGLKHLNLDKGTFAALSELHCDKLVDPENFRLLGNVLCVLAHHFG 120
P02070      VKAHGKKVLDSPFNGMKHLLDNLKGTFAALSELHCDKLVDPENFRLLGNVLCVLAHHFG 118
P02094      VKAHGKKVIHSPFADGLKHLNLDKGTFAALSELHCDKLVDPENFRLLGNVLCVLAHHFG 120
P02112      VRAHGKKVLTSPFGDAVKNLNLDKGTFAALSELHCDKLVDPENFRLLGNVLCVLAHHFG 120
P14524      VQAHGKKVLTSPFGDAVKNLNLDKGTFAALSELHCDKLVDPENFRLLGNVLCVLAHHFG 119
P83123      VLAHGKKVLTSPFGDAVKNLNLDKGTFAALSELHCDKLVDPENFRLLGNVLCVLAHHFG 120
P02130      VQEHGKKVLSAFGEAVKHLNLDKGTFAALSELHCDKLVDPENFRLLGNVLCVLAHHFG 119
P02140      VAAHGRTVMGGLERAIKNMDNIKATYAPLSVMHSEKLVDPENFRLLGNVLCVLAHHFG 119
Q1AGS7      VANHGVALTGLRALTALDHMDIKATYATLSVLHSEKLVDPENFRLLGNVLCVLAHHFG 120
P07409      VQTHAGKVVSAITVAYNHIDDKPHFVELSKKHYEELHVDPENFKLLANCLEVELGHALH 115
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P68871      KE-FTPPVQAAYQKVVAGVANALAHKYH 147
P68873      KE-FTPPVQAAYQKVVAGVANALAHKYH 147
P02062      KD-FTPPELQASYQKVVAGVANALAHKYH 146
P02067      HD-FNPNVQAAYQKVVAGVANALAHKYH 147
P02070      KE-FTPVLAQDFQKVVAGVANALAHRYH 145
P02094      KD-FTPSAQSAFHKVVAGVANALAHKYH 147
P02112      KD-FTPECQAAYQKLVVVVAHALARKYH 147
P14524      KD-FTPDCQAAYQKLVVVVAHALARKYH 146
P83123      KE-FTPASQAAYTKLVNVAHALALGYH 147
P02130      ED-FSVECHAAAFQKLVVQVAAALAAEYH 146
P02140      PSGFNADVQEAQKFLSVVVSALCRQYH 147
Q1AGS7      PT-LRPEMQAAYQKYLAVVVSALGRQYH 147
P07409      KE-FTPEVQAAYSKFSNVVVDALSKGYH 142
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P68871	HBB_HUMAN	Homo sapiens (Human)	Hemoglobin beta chain
P68873	HBB_PANTR	Pan troglodytes (Chimpanzee)	Hemoglobin beta chain
P02062	HBB_HORSE	Equus caballus (Horse)	Hemoglobin beta chain
P02067	HBB_PIG	Sus scrofa (Pig)	Hemoglobin beta chain
P02070	HBB_BOVIN	Bos taurus (Bovine)	Hemoglobin beta chain
P02094	HBB_MESAU	Mesocricetus auratus (Golden hamster)	Hemoglobin beta chain
P02112	HBB_CHICK	Gallus gallus (Chicken)	Hemoglobin beta chain
P14524	HBB_TURME	Turdus merula (Blackbird)	Hemoglobin beta chain
P83123	HBB_GEONI	Geochelone nigra (Galapagos giant tortoise)	Hemoglobin beta chain
P02130	HBB_ALLMI	Alligator mississippiensis (American alligator)	Hemoglobin beta chain
P02140	HBB_CARAU	Carassius auratus (Goldfish)	Hemoglobin beta chain
Q1AGS7	HBB1_BORSA	Boreogadus saida (Polar cod)	Hemoglobin beta-1 chain
P07409	HBB_SQUAC	Squalus acanthias (Spiny dogfish)	Hemoglobin beta chain