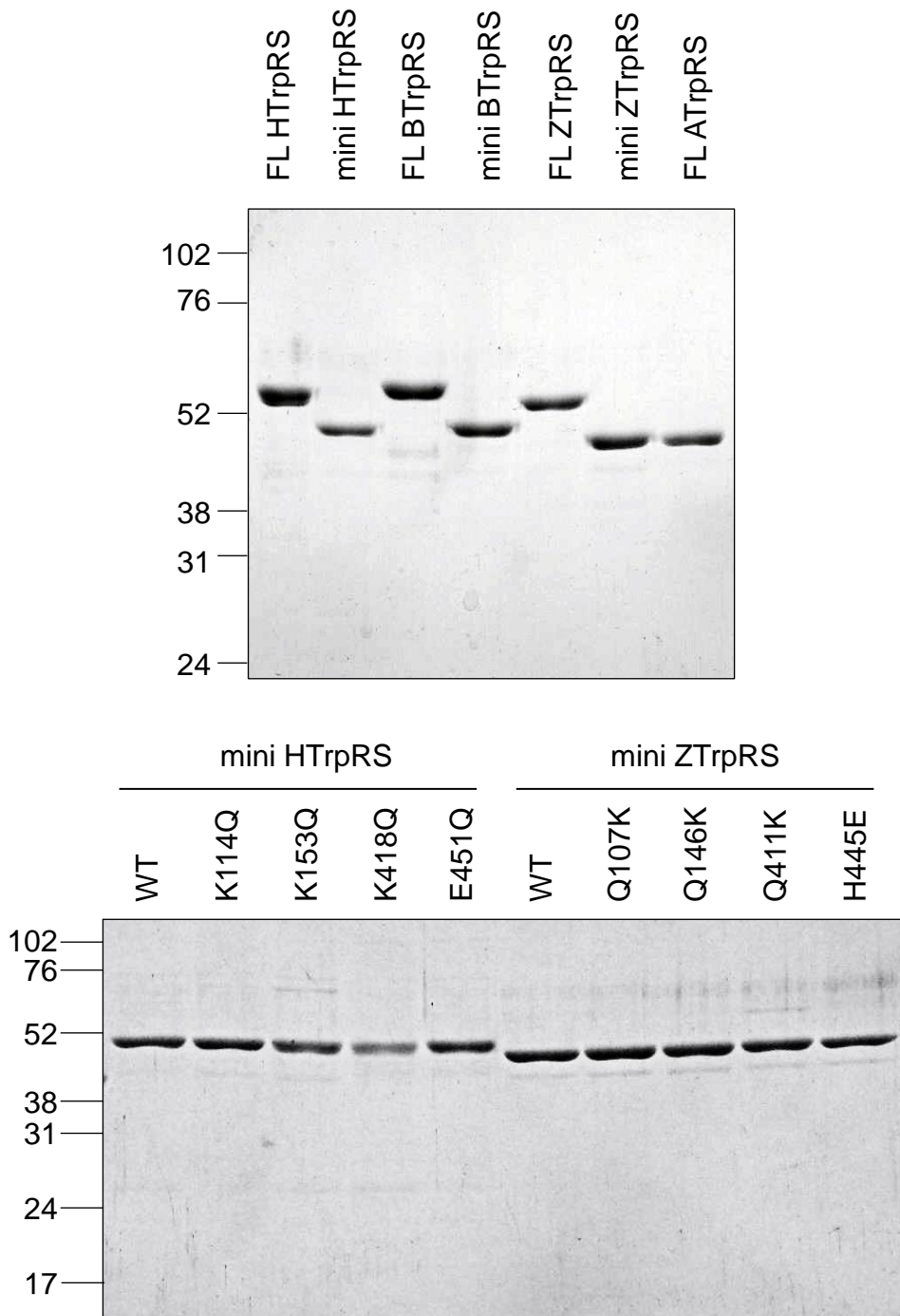


# Supplementary Figures

**Identification of a residue crucial for the angiostatic activity of human mini tryptophanyl-tRNA synthetase by focusing on its molecular evolution**

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**Supplementary Figure S1. SDS-polyacrylamide gel electrophoresis of human, bovine, zebrafish and arabidopsis TrpRS constructs used in this study.** The samples were analyzed on a 12.0% SDS-polyacrylamide gel and stained with Coomassie Blue. Molecular size markers (in kilodaltons) are shown at the left.

	1	→ mini	→ T2
Human	----MPNSEPASLLELFNSIATQGELVRS LKAGNASKDEI DSAVKMLVSLKMSYKAAAGEDYKADCPGPNPAPTSNHGPDAAEEDFVDPWTVQTS SAKGIDYDKLIVRFGS		
Macaque	-MANMPNSEPCASPLELFNSIATQGELVRS LKAGNASKDEI DSAVKMLLSLKMSYKAAMGEDYKADCPGPNPAPTSNHGPDAAEAEEDFVDPWTVQTS SAKGIDYDKLIVRFGS		
Bovine	MADMSNGEQGCGSPLELFHSLAAQGELVRLDLKARNAAKDEI DSAVKMLLSLKTYSYKAAATGEDYKVDCCPGDPAPESGEGLDATAEADFVDPWTVQTS SAKGIDYDKLIVRFGS		
Chicken	MADSPNCDLKLSPLQLFEKVTQEQEKVRLAKAGKAPKDEI DAAVRLLSLKLKSYKTTTGGQDYQAGLPPKDHALINNG--TTKEEDEDLVDPWVQVTSNAKGVQDYDKLIVRFGS		
Snake	MADNPNGSFCSLKLPLELFEQIAAQGENVRS LKSKKESKDEI DAAVKLLLSLKVYKATATGQEQYKADSPPTDFTFVSN--PDNIEGDDFVDPWTVQVTSNAKGVQDYDKLIVRFGS		
Frog	MSDSGTDASGSLIPMDLYDRVTAQGDKVRVLKSEKAPKEEIDVAVKLLLALKVDYKNTVGGQDYKPGVPPADDMP TNSNGPSTTDNGDDFVDPWVQVTSNAKGVQDYDKLIVRFGS		
Fugu	-MADSPDFERTMSPLELYEKLTAQGDQVRALKTAKSDKAEI DAAVQLLLKMKLEYKQVTGQDYKAGSPPSENSAPFNGATADGSNDEDTVDPWVSTTNAKGVQDYDKLIVRFGS		
Zebrafish	-----MSSPLDLYECVTAQGETVRS IKAKKGSKEEVDAAVQVLLQMKLDYKRVTTGQDYKAGC PPDQGVTPQDGAAP--QDGEDQVDPWSVSSSSAKGVQDYDKLIVRFGS		
Human	114 SKIDKELINRIERATGQRPHHFLRRGIFFSHRDMNQVLDAYENKPFYLYTGRGPSSEAMHVGHLPFI FTKWLQDVFNVLVIQMTDDEKYLWKDLTLDQAYS YAVENAKDII	153	
Macaque	SKIDKELINRIERATGQRPHRFLRRGIFFSHRDMNQVLDAYENKPFYLYTGRGPSSEAMHVGHLPFI FTKWLQDVFNVLVIQMTDDEKYLWKDLTLDQAYGYAVENAKDII		
Bovine	SKIDKELVNRIERATGQRPHRFLRRGIFFSHRDMHQILDAYENKPFYLYTGRGPSSEAMHVGHLPFI FTKWLQDVFNVLVIQMTDDEKYLWKDLTLDQAYGYAVENAKDII		
Chicken	TKIDTDLINRIERATGQKPHRFLRRGIFFSHRDMQILHAYENKPFYLYTGRGPSSEAMHVGHLPFI FTKWLQEAQFVPLVIQMTDDEKYLWKDMTEKAYEYAKENARDII		
Snake	SKIDKDLINRIERITGHKPHHFLRRGIFFSHRDMNQILDAHEKKPFYLYTGRGPSSEAMHVGHLPFI FTKWLQETFNVLVIQMTDDEKYLWKDLTIEKAYQYAIENIKDII		
Frog	SKIDQQLVDRIQRVTGQKPHHFLRRGIFFSHRDMHQVLDAYENKPFYLYTGRGPSSEALHVGHLPFI FTKWLQEVFNVLVQVLT DDEKYLWKDLTLEKAYQYAIENAKDII		
Fugu	SKIDQQLVDRIEKVSGQKPHRFLRRGIFFSHRDMHQVLDAYENKPFYLYTGRGPSSEAMHVGHLPFI FTKWLQDVFDIPLVIQLT DDEKYLWKDLTIECHRFAVENAKDII		
Zebrafish	SKVDQELVDRI SRLTGKTPHRFLRRGIFFSHRDMHQILDAFEQQKPFYLYTGRGPSQA I HVGHLPFI FTKWLQDVFDVPLVIQLT DDEKYLWKDLTLEECRRFTVENARDII		
Human	ACGFDINKTTFIFSDLDYMGMSGGFYKNVVKIQKHVTFNQVKGIFGFTSDSICIGKISFPAIQAA PFSNSFPQIFRDRTDIQCLIPCAIDQDPYFRMTRDVAPRIGYKPKALLHS		
Macaque	ACGFDINKTTFIFSDLDYMGMSGGFYKNVVKIQKHVTFNQVKGIFGFTSDSICIGKISFPAIQAA PFSNSFPQIFQDRTDIQCLIPCAIDQDPYFRMTRDVAPRIGYKPKALLHS		
Bovine	ACGFDINKTTFIFSDLDYMGMSPGFYKNVVKIQKHVTFNQVKGIFGFTSDSICIGKISFPAIQAA PFSNSFPQIFRDRTDVQCLIPCAIDQDPYFRMTRDVAPRIGYKPKALLHS		
Chicken	ACGFDVNTKTFIFSDLDYLGSSGTFYKNI IKVQKHVTFNQVKGIFGFTSDSICIGKISFPAIQAA PFSNSFPQIFNGKENIQCLIPCAIDQDPYFRMTRDVAPRIGYKPKALLHS		
Snake	ACGFDINKTTFIFSDFSYIGTSLGFYKNIVKVQKHVTFNQVKGIFGFTSDSICIGKISFPAIQAA PFSNSFPQIFNNRKDVQCLIPCAIDQDPYFRMTRDVAPRIGYKPKALLHS		
Frog	ACGFDVNTKTFIFSDLEYMGKSGFYQNVVKVQKHVTFNQVKGIFGFTSDSICIGKISFPAIQAA PFSNSFPQIFKGRKDIQCLIPCAIDQDPYFRMTRDVAPRINYKPKALMHS		
Fugu	ACGFDVNTKTFIFSDLDYMGASPEFYRNVVKIEKHVTFNQVKGIFGFTSDSICIGKISFPAIQAA PFSNSFPQIFGSRKDIQCLIPCAIDQDPYFRMTRDVAPRIGYKPKALLHS		
Zebrafish	ACGFDVNTKTFIFSDLEYMGASPAFYRNVVKVQKHVTFNQVKGIFGFTSDSICIGKISFPAIQAA PFSNSFPQIFGDRKDVQCLIPCAIDQDPYFRMTRDVAPRIGYKPKALLHS		
Human	TFFPALQGAQT KMSASDPNSSIFLTD TAKQIKTKVNKHA FSGGRD TIEHRQFGGNC DVVSYMYL TFFLEDDDKLEQIRKDY TSGAMLTGELKKALIEVLQPLIAEHQARRKE	418	451
Macaque	TFFPALQGAQT KMSASDPNSSIFLTD TAKQIKTKVNKHA FSGGRD TIEHRQFGGNC DVVSYMYL TFFLEDDDKLEQIRKDY TSGNMLT GELKKVLI EVLQPLIAEHQARRKE		
Bovine	TFFPALQGAQT KMSASDPNSSIFLTD TAKQIKTKVNKHA FSGGRD TVEHRQFGGNC DVVSYMYL TFFLEDDDKLEQIRDY TSGAMLTGELKKELIEVLQPLIAEHQARRKE		
Chicken	VFFPALQGAQT KMSASDVNSSVFLNDTPKQIKTKINKHAFSGGRD TIEHRKYG GNC DVVSYMYL TFFLEDDDKLEQLKQAY TSGELLT GELKKVLI ETLQPLIAAHQERRKQ		
Snake	VFFPALQGAQT KMSASDPNSSIFLTDTPKQIKTKINKHAFSGGKDTVEHRQYGGNC DVVSYMYL TFFLEDDDRLEQIKQAY TSGALLT GELKKVLI ETLQPLIAAHQERRKQ		
Frog	TFFPALQGAQT KMSASDPNSSIFLTD TAKQIKNKINKYAFSGGKDTIEHRQFGGNC DVVSYMYL TFFLEDDERLEQIKQDYSSGALLT GELKKLI ETLQPLIAAHQERRKH		
Fugu	TFFPALQGAQT KMSASDANSTIFLTDTPKQIKTKVNKHA FSGGKDTVEHRKHGGNPDV VSYMYL TFFLEDDQLEKIRQDYASGALLT GELKKMLIDTLQPMIAHQERRKQ		
Zebrafish	TFFPALQGAQT KMSASDANSTIFLTDTPKQIKNKVNKHA FSGGKDTIEHRKLGDPDV VSYMYL TFFLEDDQLEKIRQDYSSGAMLT GELKKS LI DTLQPLIAEHQERRKH		
Human	VTDEIVKEFMTPRKLSFDFQ	471	
Macaque	VTDEIAKQFMTPRELSFDFQ		
Bovine	VTDEIVKEFMTPRKLSYDFQ		
Chicken	ITDEVVKQFMTPRKLAFF-		
Snake	ITDEMVKFMTPRKLAFDY-		
Frog	ITEEAVKQFMMPRKLAFF-		
Fugu	VTDETQKQFMTFRPLNFKH-		
Zebrafish	VTDDIVQQFMTPRKLHFSC-		

**Supplementary Figure S2. Sequence alignment among vertebrate TrpRS proteins.** Multiple sequence alignment was performed by Clustal W with manual adjustments. Gaps in the sequences are indicated by dashes. Numbers above the sequences correspond to those of the residues of human TrpRS. Conserved crucial acidic (Glu or Asp) and basic (Arg or Lys) residues are highlighted in yellow.