

Supplementary Table 1. Data collection and refinement statistics

	APY-EphA4	APY- β Ala8.am-EphA4
Crystal		
Space group	P2 ₁	P2 ₁
Cell dimensions		
a, b, c (Å)	36.27, 127.7, 84.57	37.22, 127.2, 84.6
α , β , γ (°)	90, 90, 90	90, 90, 90
Data processing statistics		
Resolution (Å)	50.95-2.42 (2.52-2.42)	50.83-2.41 (2.51-2.41)
R _{merge}	0.073 (0.219)	0.061 (0.207)
Reflections	179142 (18172)	99518 (27979)
Unique reflections	27280 (2882)	9181 (27766)
I/ σ I	14.4 (4.9)	13.1 (4.8)
CC1/2	0.995 (0.971)	0.996 (0.935)
Completeness (%)	93.4 (90.1)	92.3 (80.6)
Redundancy	6.6 (6.3)	3.6 (3.3)
Model		
Peptide-EphA4 complexes per asymmetric unit	4	4
No. atoms		
Peptide/EphA4	388/5703	392/5670
Water	176	150
Other solvent	60	140
Refinement statistics		
Resolution (Å)	50.95-2.42 (2.48-2.42)	40.14-2.41 (2.47-2.41)
Reflections	27253 (1860)	27951 (1778)
R _{work} /R _{free}	0.1706/0.2325 (0.301/0.423)	0.1733/0.2406 (0.199/0.252)
R.m.s deviations		
Bond lengths (Å)	0.011	0.01
Bond angles (°)	1.468	1.419
Ramachandran*		
favored (%)	91.8	92.5
allowed (%)	7.9	6.9
MolProbity Score/Percentile*	2.25/84th	1.86/96th

*The β Ala residue was omitted from the analysis.

Supplementary Table 2. Phage display libraries

Name	Sequence
APY peptide	APYCVYRGSWSC
Library 1	APXCVXRGWSWC
Library 2	APYCX ^Y X ^G XXXXC F F W L C Q
Library 3	APYCVYXGXWXC
Library 4	XXXCVYRGSWSC

Supplementary Table 3. Sequences from non-panned phage clones

# of clones	Peptide sequence	DNA sequence												EphA4 binding
library 1	APXCVRGSWSC	GCT	CCG	NNK	TGT	GTG	NNK	AGG	GGT	TCT	TGG	TCG	TGT*	
1	APYCVWRGSWSC	GCT	CCG	TAT	TGT	GTG	TGG	AGG	GGT	TCT	TGG	TCG	TGT	+
1	APACVLRGSWSC	GCT	CCG	GCG	TGT	GTG	TTG	AGG	GGT	TCT	TGG	TCG	TGT	-
1	APACVVRGSWSC	GCT	CCG	GCG	TGT	GTG	GTG	AGG	GGT	TCT	TGG	TCG	TCT	-
1	APCCVERGSWSC	GCT	CCG	TGT	TGT	GTG	GAG	AGG	GGT	TCT	TGG	TCG	TCT	-
1	APCCVGRGSWSC	GCT	CCG	TGT	TGT	GTG	GGT	AGG	GGT	TCT	TGG	TCG	TGT	-
1	APDCVQRGSWSC**	GCT	CCG	GAT	TGT	GTG	TAG	AGG	GGT	TCT	TGG	TCG	TGT	-
1	APDCVVRGSWSC	GCT	CCG	GAT	TGT	GTG	GTG	AGG	GGT	TCT	TGG	TCG	TGT	-
1	APECVARGSWSC	GCT	CCG	GAG	TGT	GTG	GCT	AGG	GGT	TCT	TGG	TCG	TGT	-
1	APGCVDRGSWSC	GCT	CCG	GGT	TGT	GTG	GAT	AGG	GGT	TCT	TGG	TCG	TGT	-
1	APGCVVRGSWSC	GCT	CCG	GGG	TGT	GTG	GTT	AGG	GGT	TCT	TGG	TCG	TGT	-
1	APICVMRGSWSC	GCT	CCG	ATT	TGT	GTG	ATG	AGG	GGT	TCT	TGG	TCG	TCT	-
1	APICVTRGSWSC	GCT	CCG	ATT	TGT	GTG	ACT	AGG	GGT	TCT	TGG	TCG	TGT	-
1	APKCVDRGSWSC	GCT	CCG	AAG	TGT	GTG	GAT	AGG	GGT	TCT	TGG	TCG	TCT	-
1	APLCVERGSWSC	GCT	CCG	CTT	TGT	GTG	GAG	AGG	GGT	TCT	TGG	TCG	TGT	-
1	APLCVPRGSWSC	GCT	CCG	CTG	TGT	GTG	CCT	AGG	GGT	TCT	TGG	TCG	TGT	-
1	APLCVSRGSWSC	GCT	CCG	CTT	TGT	GTG	TCG	AGG	GGT	TCT	TGG	TCG	TCT	-
1	APMCVNRGSWSC	GCT	CCG	ATG	TGT	GTG	AAT	AGG	GGT	TCT	TGG	TCG	TGT	-
1	APNCVGRGSWSC	GCT	CCG	AAT	TGT	GTG	GGT	AGG	GGT	TCT	TGG	TCG	TGT	-
1	APNCVMRGSWSC	GCT	CCG	AAT	TGT	GTG	ATG	AGG	GGT	TCT	TGG	TCG	TCT	-
1	APPCVLRGSWSC	GCT	CCG	CCG	TGT	GTG	CTT	AGG	GGT	TCT	TGG	TCG	TGT	-
1	APPCVSRGSWSC	GCT	CCG	CCT	TGT	GTG	TCT	AGG	GGT	TCT	TGG	TCG	TGT	-
1	APSCVDRGSWSC	GCT	CCG	TCG	TGT	GTG	GAT	AGG	GGT	TCT	TGG	TCG	TGT	-
1	APSCVPRGSWSC	GCT	CCG	AGT	TGT	GTG	CCT	AGG	GGT	TCT	TGG	TCG	TGT	-
1	APTCVSRGSWSC	GCT	CCG	ACG	TGT	GTG	TCG	AGG	GGT	TCT	TGG	TCG	TGT	-
1	APTCVTRGSWSC	GCT	CCG	ACT	TGT	GTG	ACT	AGG	GGT	TCT	TGG	TCG	TGT	-
1	APVCVQRGSWSC	GCT	CCG	GTG	TGT	GTG	CAG	AGG	GGT	TCT	TGG	TCG	TGT	-
1	APVCVSRGSWSC	GCT	CCG	GTT	TGT	GTG	AGT	AGG	GGT	TCT	TGG	TCG	TGT	-
1	APWCVIRGSWSC	GCT	CCG	TGG	TGT	GTG	ATT	AGG	GGT	TCT	TGG	TCG	TGT	-
1	APWCVQRGSWSC	GCT	CCG	TGG	TGT	GTG	CAG	AGG	GGT	TCT	TGG	TCG	TGT	-
1	APYCVPRGSWSC	GCT	CCG	TAT	TGT	GTG	CCT	AGG	GGT	TCT	TGG	TCG	TGT	-
1	APYCVWRGSWSC	GCT	CCG	TAT	TGT	GTG	TGG	AGG	GGT	TCT	TGG	TCG	TGT	+
library 2	APYCXIXGXXXX	GCT	CCG	TWT	TGT	NNK	TDK	NNK	GGT	NNK	NNK	NNK	TGT	
	F F													
	W													
	L													
	C													
	Q													
1	APFCAWPGPTPC	GCT	CCG	TTT	TGT	GCG	TGG	CCG	GGT	CCT	ACT	CCT	TGT	-
1	APFCLYEGKALC	GCT	CCG	TTT	TGT	CTT	TAT	GAG	GGT	AAG	GCT	CTT	TGT	-
1	APFCPFGGNVQC	GCT	CCG	TTT	TGT	CCT	TTT	GGT	GGT	AAT	GTT	CAG	TGT	-
1	APFCPFKGDPLC	GCT	CCG	TTT	TGT	CCG	TTT	AAG	GGT	GAT	CCT	CTT	TGT	-
1	APFCSWHAQRC	GCT	CCG	TTT	TGT	TCG	TGG	CAT	GGT	GCT	CAG	AGG	TGT	-
1	APFCSYMGTPLC	GCT	CCG	TTT	TGT	TCT	TAT	ATG	GGT	ACG	CCT	TTG	TGT	-
1	APFCSYRGHHPC	GCT	CCG	TTT	TGT	TCT	TAT	CGT	GGT	CAT	CAT	CCT	TGT	-
1	APFCTYQGHLDL	GCT	CCG	TTT	TGT	ACT	TAT	TAG	GGT	CAT	CTT	GAT	TGT	-

1	APYCAWAGKVRC	GCT	CCG	TAT	TGT	GCT	TGG	GCT	GGT	AAG	GTT	AGG	TGT	-
1	APYCKFAGDTSC	GCT	CCG	TAT	TGT	AAG	TTT	GCG	GGT	GAT	ACT	TCT	TGT	-
1	APYCKLNGHKNC	GCT	CCG	TAT	TGT	AAG	TTG	AAT	GGT	CAT	AAG	AAT	TGT	-
1	APYCPQTGKYSC	GCT	CCG	TAT	TGT	CCT	TAG	ACT	GGT	AAG	TAT	TCT	TGT	-
1	APYCPYNGPVRC	GCT	CCG	TAT	TGT	CCG	TAT	AAT	GGT	CCG	GTG	CGT	TGT	-
1	APYCQLAGNIPC	GCT	CCG	TAT	TGT	CAG	TTG	GCT	GGT	AAT	ATT	CCG	TGT	-
1	APYCSFSGHDKC	GCT	CCG	TAT	TGT	AGT	TTT	AGT	GGT	CAT	GAT	AAG	TGT	-
1	APYCSLQGHYLC	GCT	CCG	TAT	TGT	TCT	TTG	CAG	GGT	CAT	TAT	CTT	TGT	-
1	APYCSYNGPHTC	GCT	CCG	TAT	TGT	TCT	TAT	AAT	GGT	CCT	CAT	ACT	TGT	-
1	APYCTQKGLNSC	GCT	CCG	TAT	TGT	ACT	TAG	AAG	GGT	CTT	AAT	AGT	TGT	-
1	APYCTWHGTRNC	GCT	CCG	TAT	TGT	ACT	TGG	CAT	GGT	ACT	CGT	AAT	TGT	-
1	APYCYLAGASPC	GCT	CCG	TAT	TGT	TAT	TTG	GCG	GGT	GCT	TCG	CCT	TGT	-
1	APYCYWNGAYTC	GCT	CCG	TAT	TGT	TAT	TGG	AAT	GGT	GCT	TAT	ACT	TGT	-

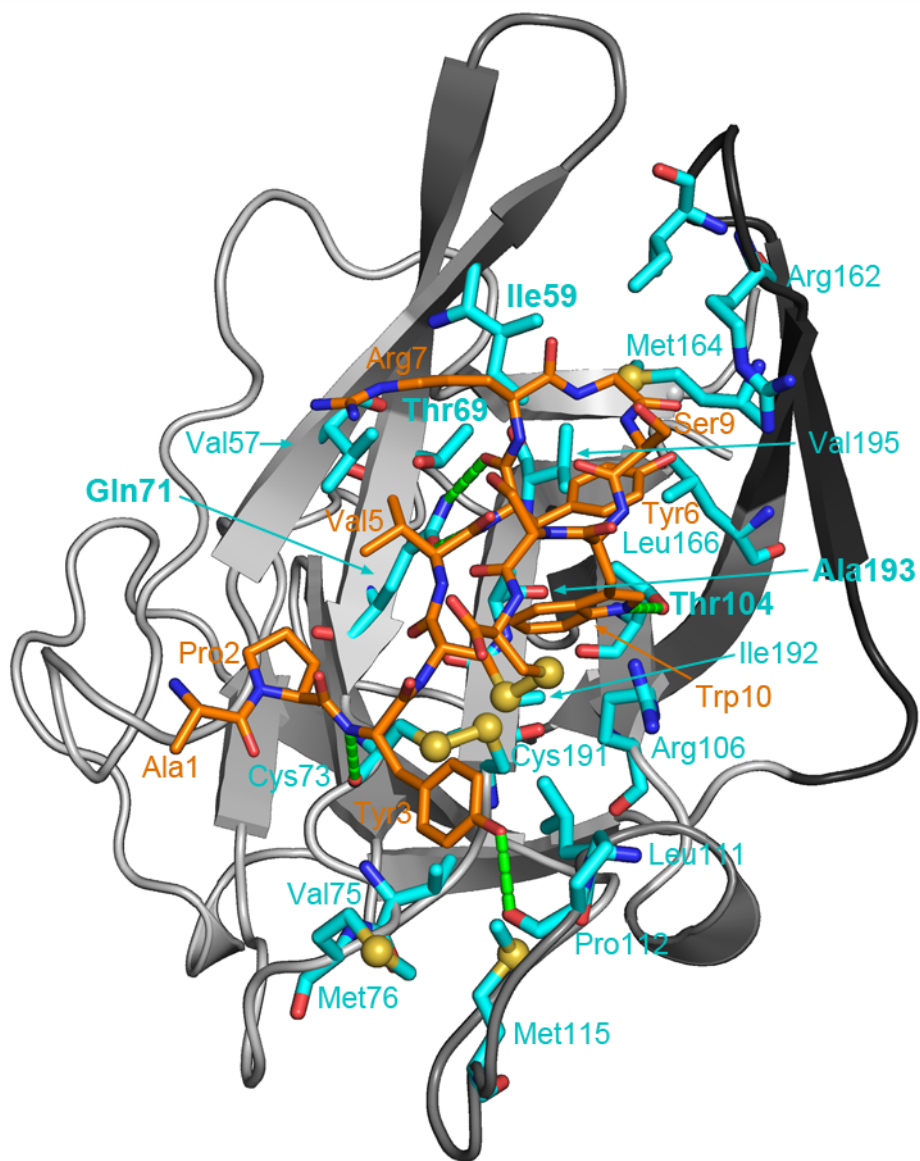
library 3	APYCVYXGXWXC	GCT	CCG	TAT	TGT	GTG	TAT	NNK	GGT	NNK	TGG	NNK	TGT	
1	APYCVYAGKWSC	GCT	CCG	TAT	TGT	GTG	TAT	GCT	GGT	AAG	TGG	TCG	TGT	+
1	APYCVYEGLWNC	GCT	CCG	TAT	TGT	GTG	TAT	GAG	GGT	CTG	TGG	AAT	TGT	+
1	APYCVYGGWTC	GCT	CCG	TAT	TGT	GTG	TAT	GGG	GGT	TTG	TGG	ACG	TGT	+
2	APYCVYKGSWNC	GCT	CCG	TAT	TGT	GTG	TAT	AAG	GGT	TCG	TGG	AAT	TGT	+
1	APYCVYQLWEC	GCT	CCG	TAT	TGT	GTG	TAT	CAG	GGT	TTG	TGG	GAG	TGT	+
1	APYCVYRGHWGC	GCT	CCG	TAT	TGT	GTG	TAT	CGG	GGT	CAT	TGG	GGG	TGT	+
1	APYCVYAGHWPC	GCT	CCG	TAT	TGT	GTG	TAT	GCG	GGT	CAT	TGG	CCG	TGT	-
1	APYCVYHGPWGC	GCT	CCG	TAT	TGT	GTG	TAT	CAT	GGT	CCT	TGG	GGT	TGT	-
1	APYCVYPGDWAC	GCT	CCG	TAT	TGT	GTG	TAT	CCG	GGT	GAT	TGG	GCT	TGT	-
1	APYCVYPGHWQC	GCT	CCG	TAT	TGT	GTG	TAT	CCT	GGT	CAT	TGG	CAG	TGT	-
1	APYCVYQGAWGC	GCT	CCG	TAT	TGT	GTG	TAT	CAG	GGT	GCT	TGG	GGT	TGT	-
1	APYCVYQGPWRC	GCT	CCG	TAT	TGT	GTG	TAT	CAG	GGT	CCG	TGG	CGT	TGT	-
1	APYCVYTGAWPC	GCT	CCG	TAT	TGT	GTG	TAT	ACT	GGT	GCT	TGG	CCG	TGT	-
1	APYCVYVGGWPC	GCT	CCG	TAT	TGT	GTG	TAT	GTG	GGT	GGT	TGG	CCT	TGT	-

library 4	XXXCVYRGSWSC	NNK	NNK	NNK	TGT	GTG	TAT	AGG	GGT	TCT	TGG	TCG	TGT	
1	ALSCVYRGSWSC	GCT	CTG	TCT	TGT	GTG	TAT	AGG	GGT	TCT	TGG	TCG	TGT	-
1	AVACVYRGSWSC	GCG	GTG	GCG	TGT	GTG	TAT	AGG	GGT	TCT	TGG	TCG	TGT	-
1	FPPCVYRGSWSC	TTT	CCT	CCT	TGT	GTG	TAT	AGG	GGT	TCT	TGG	TCG	TGT	-
1	GDWCVYRGSWSC	GGT	GAT	TGG	TGT	GTG	TAT	AGG	GGT	TCT	TGG	TCG	TGT	-
1	GNECVYRGSWSC	GGT	AAT	GAG	TGT	GTG	TAT	AGG	GGT	TCT	TGG	TCG	TGT	-
1	GYTCVYRGSWSC	GGG	TAT	ACG	TGT	GTG	TAT	AGG	GGT	TCT	TGG	TCG	TGT	-
1	HQACVYRGSWSC	CAT	CAG	GCT	TGT	GTG	TAT	AGG	GGT	TCT	TGG	TCG	TGT	-/+
1	LCACVYRGSWSC	TTG	TGT	GCT	TGT	GTG	TAT	AGG	GGT	TCT	TGG	TCG	TGT	-
1	LENCVYRGSWSC	CTG	GAG	AAT	TGT	GTG	TAT	AGG	GGT	TCT	TGG	TCG	TGT	-
1	LLSCVYRGSWSC	TTG	TTG	AGC	TGT	GTG	TAT	AGG	GGT	TCT	TGG	TCG	TGT	-
1	MSECVYRGSWSC	ATG	TCG	GAG	TGT	GTG	TAT	AGG	GGT	TCT	TGG	TCG	TGT	-
1	MVNCVYRGSWSC	ATG	GTG	AAT	TGT	GTG	TAT	AGG	GGT	TCT	TGG	TCG	TGT	-
2	NNHCVYRGSWSC	AAT	AAT	CAT	TGT	GTG	TAT	AGG	GGT	TCT	TGG	TCG	TGT	-
1	VDESCVYRGSWSC	GTG	GAT	TCT	TGT	GTG	TAT	AGG	GGT	TCT	TGG	TCG	TGT	-

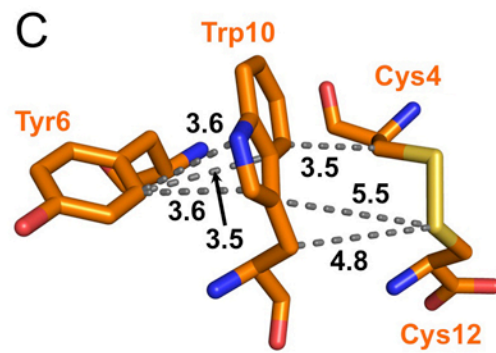
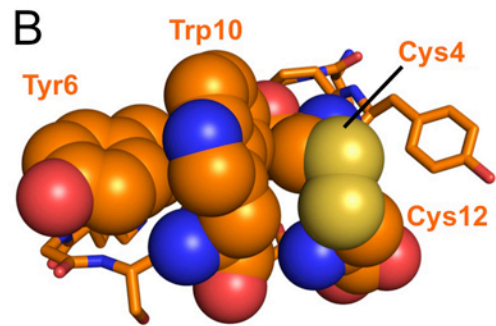
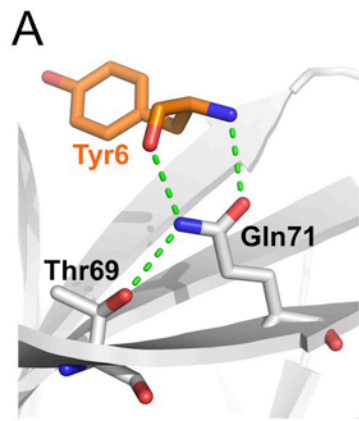
*M = A/C; K = G/T; W = A/T; D = A/G/T; N = A/C/G/T

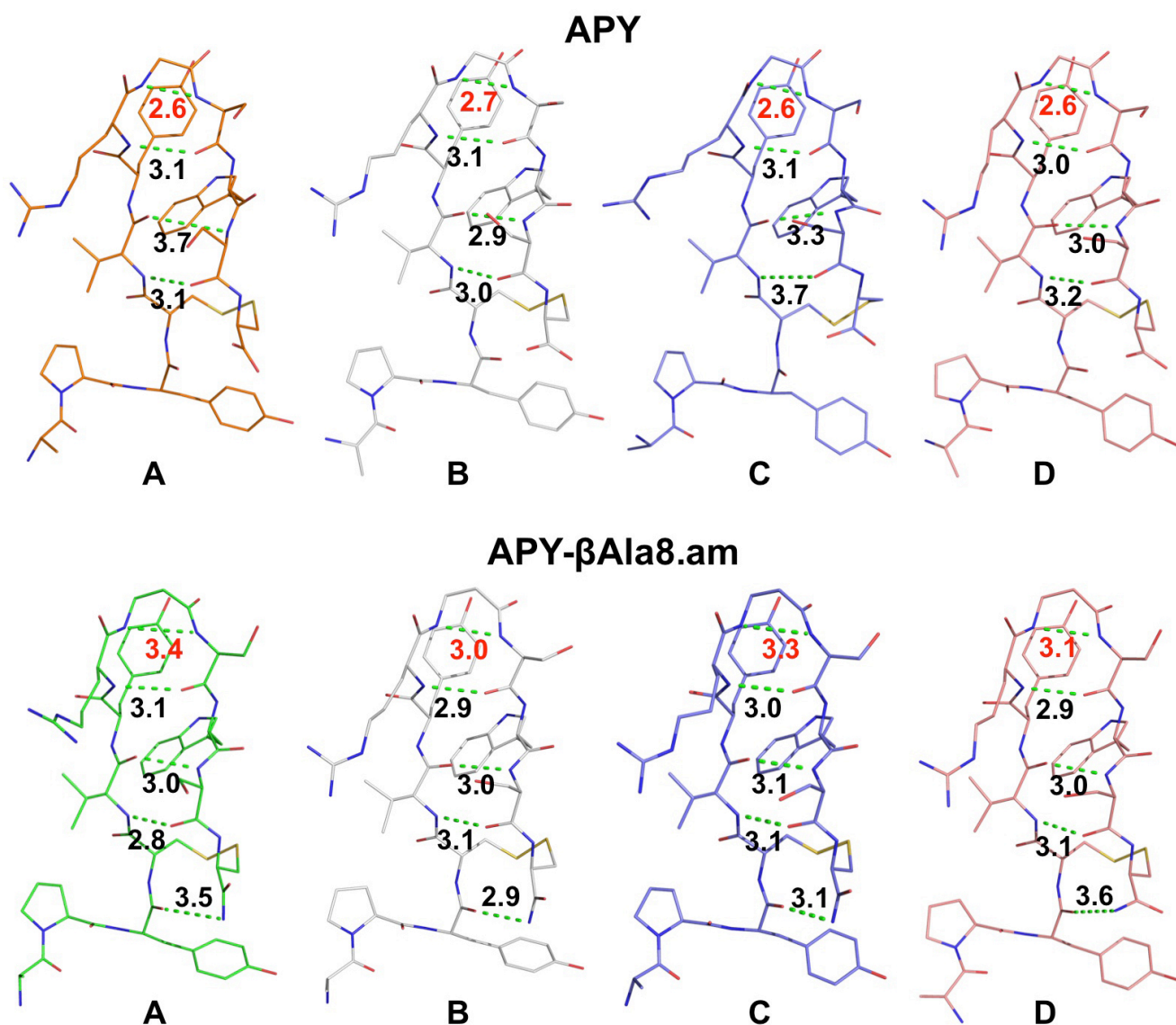
**TAG = Q

Supplementary Figure 1



Supplementary Figure 2





Peptide hydrogen bond and β -turn N-N distances (Å)								
	APY				APY- β Ala8.am			
	A	B	C	D	A	B	C	D
Gly8/βAla8 N – Ser9 N	2.6	2.7	2.6	2.6	3.4	3	3.3	3.1
Arg7 N – Ser9 O	3.1	3.1	3.1	3.0	3.1	2.9	3.0	2.9
Val5 O – Ser11 N	3.7	2.9	3.3	3.0	3.0	3.0	3.1	3.0
Val5 N – Ser11 O	3.1	3.0	3.7	3.2	2.8	3.1	3.1	3.1
Tyr3 O – C-term N	---	---	---	---	3.5	2.9	3.1	3.6

Supplementary Figure 4

