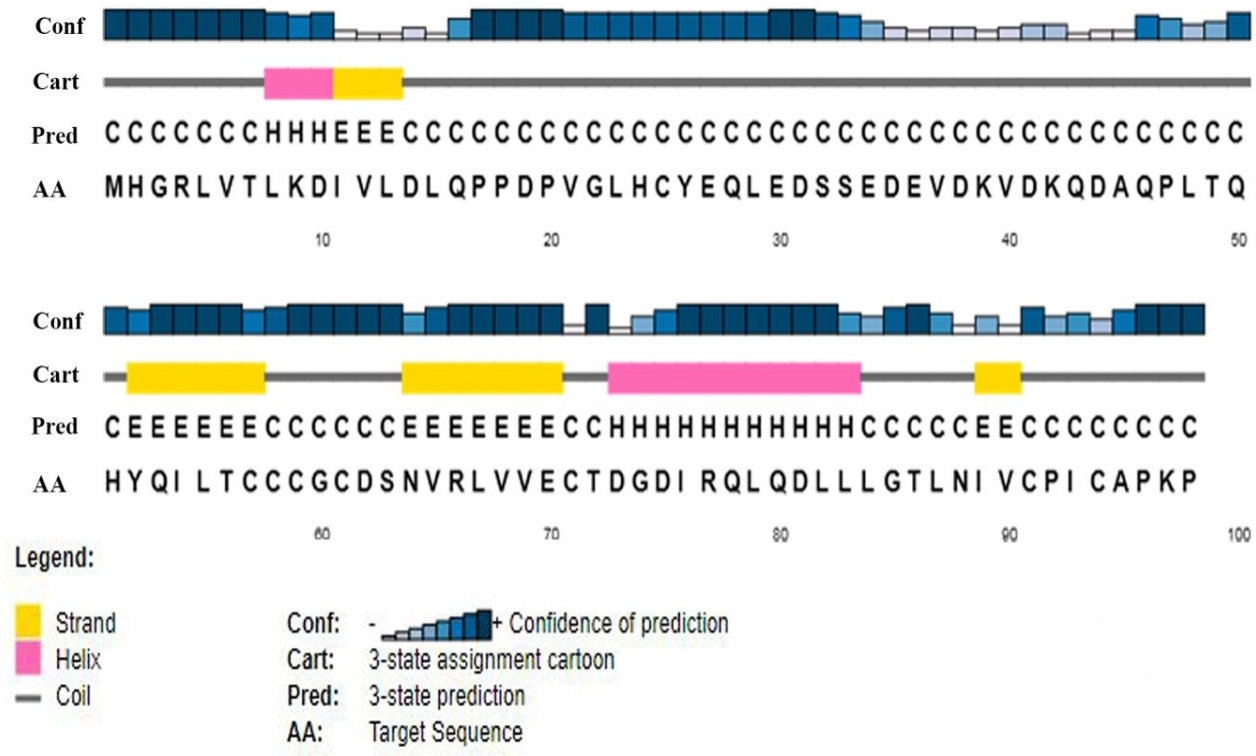
Interpretations on the interaction between protein tyrosine Phosphatase and E7 oncoproteins of high and low risk HPV – A computational perception

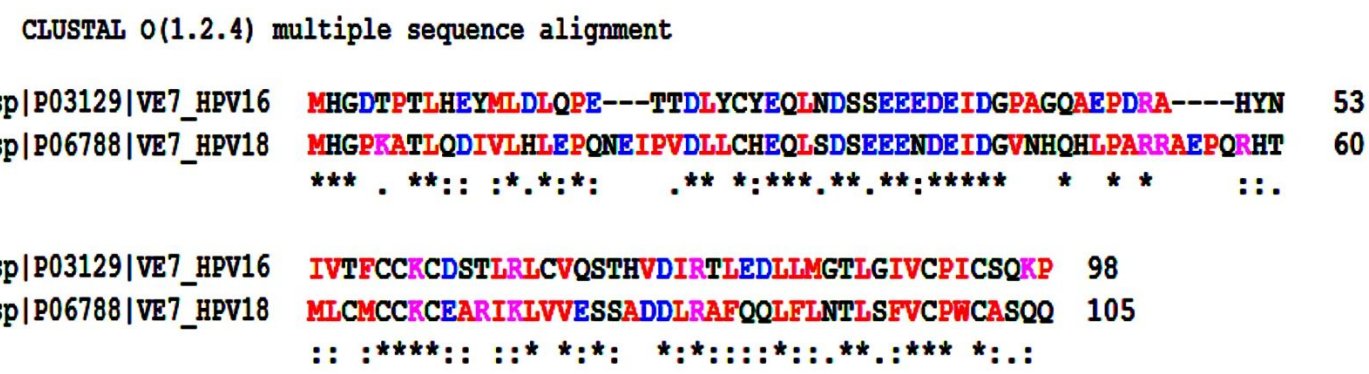
Murali Aarthy and Sanjeev Kumar Singh*

Computer Aided Drug Design and Molecular Modeling Lab, Department of Bioinformatics, Alagappa University, Karaikudi - 630004

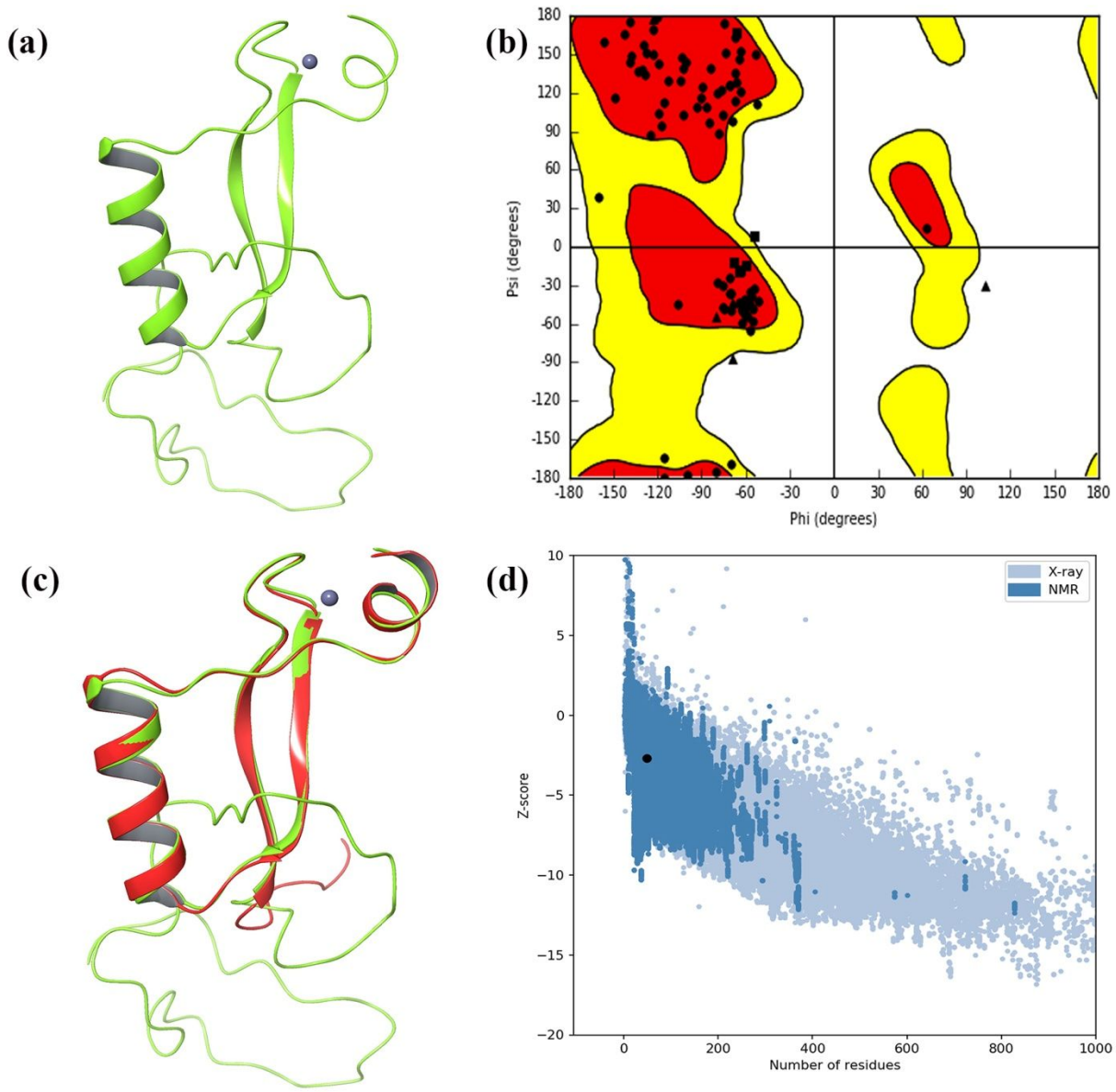
*E-mail: skysanjeev@gmail.com



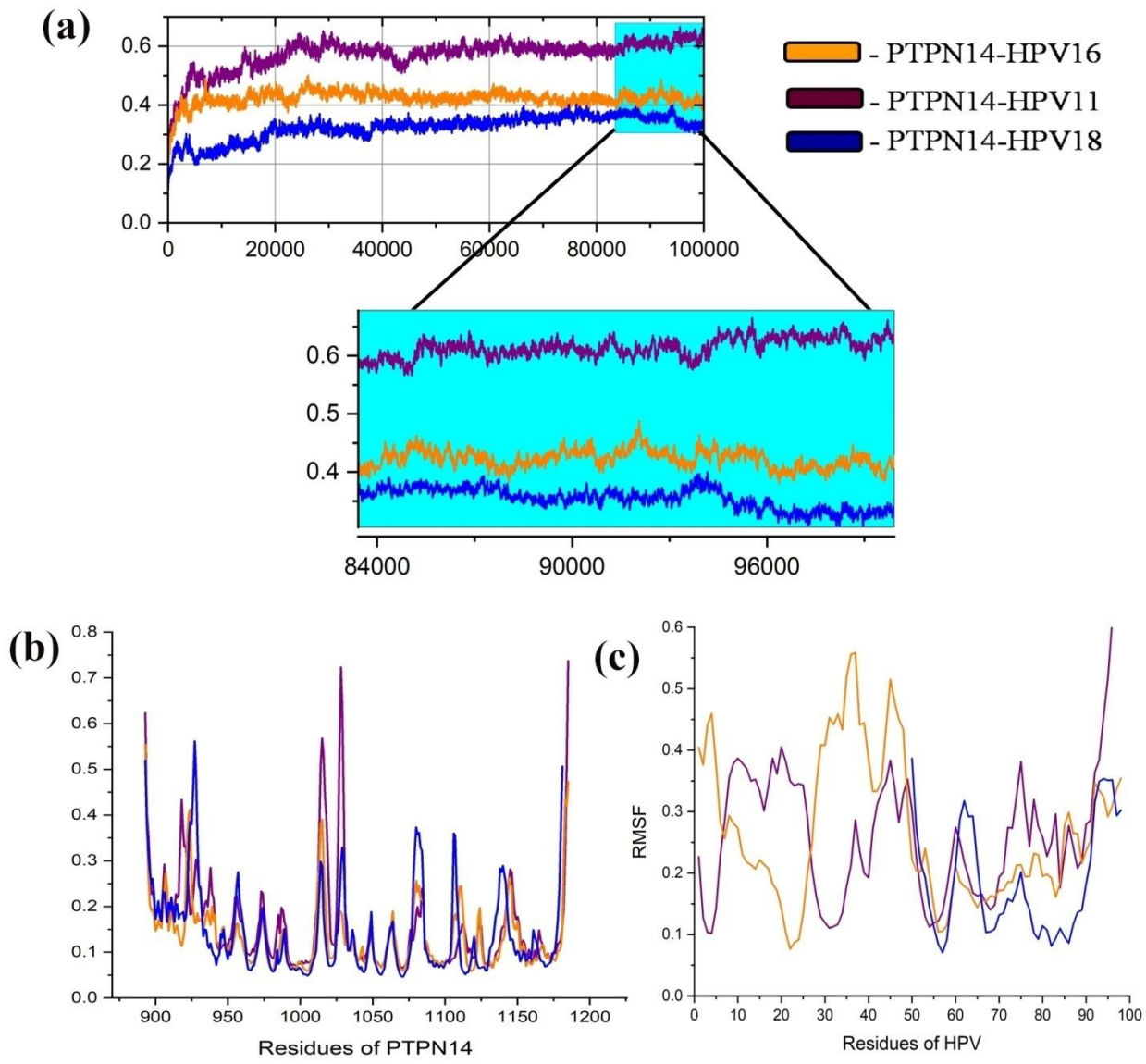
Supplementary Figure S1: Secondary structure prediction for the E7 oncoprotein of HPV genotype 11



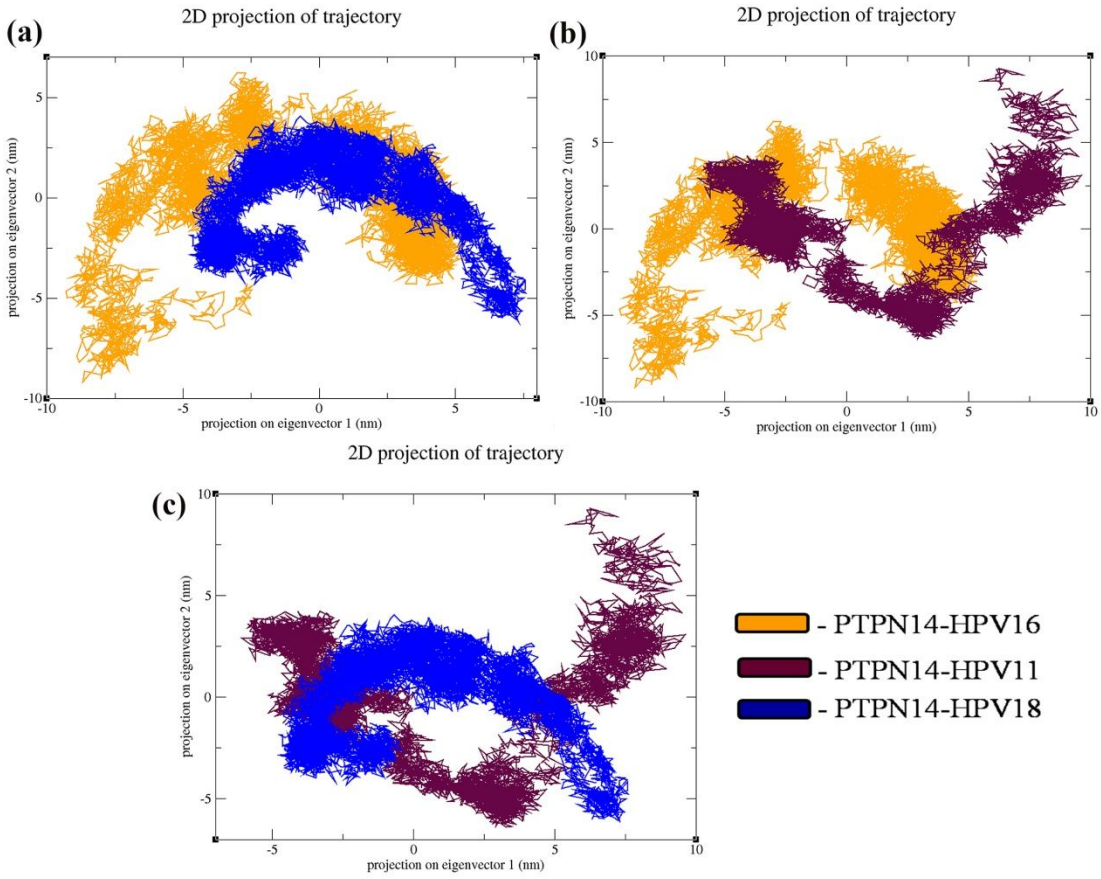
Supplementary Figure S2: Multiple sequence alignment of the HPV type 16 and 18 representing the sequence difference in both the genotypes of HPV.



Supplementary Figure S3: (a) represents the structure of the Modelled HPV 11 E7 and (c) represents the superimposed structure of the template and the modelled structure whereas (b) and (d) represents the Ramachandran plot and the ProSA score as an assessment for the modelled E7 oncoprotein respectively.



Supplementary Figure S4: Molecular Dynamics Simulation Protein – Protein complexes (a) RMSD, (b) RMSF of PTPN14 Residues, (c) RMSF of HPV E7 residues.



Supplementary Figure S5: Principle component analysis (a) PTPN14 with HPV11 & 18 E7 (b) PTPN14 with HPV16 and 11 E7 and (c) PTPN14 with HPV11 & 18 E7.

Supplementary Table S1: List of Compounds obtained from the Previous work

S.No	Compound Name	Library	Reference
1.	692320	National Chemical Library	24
2.	678359	National Chemical Library	24
3.	657269	National Chemical Library	24
4.	DB00419	FDA library	24
5.	EGCG	Natural Compound from Green Tea	25
6.	JFD01914	Maybridge Library	24
7.	ZINC14436185	ZINC Database	25
8.	ZINC49069570	ZINC Database	25
9.	ZINC49115270	ZINC Database	25

Supplementary Table S2: Docking scores for the compounds and high risk and low risk bounded to PTPN14

S.No	Compound	Docking scores		Glide energy		Glide Emodel	
		HPV 11	HPV 16	HPV 11	HPV 16	HPV 11	HPV 16
1.	692320	-12.899	-13.735	-62.300	-73.978	-95.797	-116.490
2.	678359	-8.841	-9.365	-54.061	-63.969	-86.044	-80.154
3.	657269	-7.147	-10.244	-44.616	-51.555	-67.186	-72.911
4.	DB00419	-8.967	-9.844	-60.236	-60.343	-77.589	-74.491
5.	EGCG	-11.884	-12.061	-69.860	-71.539	-90.116	-109.353
6.	JFD01914	-9.404	-8.14	-63.637	-64.345	-85.940	-81.219
7.	ZINC14436185	-10.889	-11.514	-65.518	-64.935	-73.191	-82.235
8.	ZINC49069570	-12.421	-14.148	-63.187	-77.720	-104.198	94.251
9.	ZINC49115270	-13.143	-13.318	-13.143	-70.634	-84.794	-111.032

Supplementary Table S3: Binding Free Energy Post Docking studies for the Complex HPV 16 – PTPN14 and small molecules

S.No	Compound	ΔG_{bind}	$\Delta G_{Coulomb}$	$\Delta G_{Covalent}$	ΔG_{Hbond}	ΔG_{Solv}	ΔG_{vdW}
1.	692320	-81.89	-51.02	15.30	-4.88	278.33	-47.90
2.	678359	-48.21	-21.98	6.214	-1.76	145.29	-30.78
3.	657269	-53.26	-38.70	5.12	-2.69	164.49	-31.72
4.	DB00419	-64.11	-47.47	6.05	-2.31	34.46	-28.11
5.	EGCG	-72.40	-53.19	4.98	-1.33	45.73	-33.41
6.	JFD01914	-56.05	-29.44	3.35	-2.87	58.24	-22.62
7.	ZINC14436185	-69.64	-31.43	4.10	-2.62	34.12	-32.70
8.	ZINC49069570	-93.54	-63.78	17.16	-3.43	128.12	-49.18
9.	ZINC49115270	-86.12	-55.07	10.58	-4.69	98.14	-44.21

Supplementary Table S4: Binding Free Energy Post Docking studies for the Complex HPV 11 – PTPN14 and small molecules

S.No	Compound	ΔG_{bind}	$\Delta G_{Coulomb}$	$\Delta G_{Covalent}$	ΔG_{Hbond}	ΔG_{Solv}	ΔG_{vdW}
1.	692320	-71.11	-39.73	5.31	-4.48	18.75	-51.86
2.	678359	-57.42	-22.86	4.02	-3.79	57.88	-30.87
3.	657269	-69.12	-33.47	6.54	-4.40	57.79	-42.60
4.	DB00419	-68.32	-30.54	11.01	-7.86	34.28	-29.40
5.	EGCG	-66.33	-41.64	8.76	-6.10	27.52	-35.50
6.	JFD01914	-59.05	-34.12	6.42	-5.91	42.59	-39.95
7.	ZINC14436185	-78.72	-57.08	10.07	-7.19	38.88	-56.68
8.	ZINC49069570	-70.40	-54.56	7.21	-5.16	66.68	-63.18
9.	ZINC49115270	-82.61	-63.07	9.65	-6.08	73.53	-59.24

Supplementary Table S5: Post Dynamics binding Free Energy for the Complex HPV 16 – PTPN14 and best small molecules

S.No	Compound	Binding	Van der Waals	Electrostatic	Polar	Solavation
1.	692320	-82.056 ± 14.960	-71.250 ± 18.772	-41.850 ± 28.930	63.396 ± 22.944	-10.741 ± 1.512
2.	EGCG	-120.074 ± 10.011	-98.521 ± 18.114	-56.197 ± 15.321	120.365 ± 23.450	-18.963 ± 3.042
3.	ZINC49115270	-234.331 ± 48.176	-211.280 ± 17.887	-182.435 ± 69.081	181.950 ± 39.021	-22.565 ± 1.233
4.	ZINC49069570	-242.722 ± 27.813	-233.365 ± 16.755	-286.362 ± 41.289	300.395 ± 20.941	-23.390 ±0.924

Supplementary Table S6: Post Dynamics binding Free Energy for the Complex HPV 11 – PTPN14 and best small molecules

S.No	Compound	Binding	Van der Waals	Electrostatic	Polar	Solavation
1.	692320	-92.455 ± 11.491	-87.439 ± 14.194	-81.437 ± 25.338	96.923 ± 17.400	-10.470 ± 0.756
2.	EGCG	-185.205 ± 14.592	-156.951 ± 21.620	-165.956 ± 32.208	208.660 ± 22.659	-22.799 ± 1.147
3.	ZINC49115270	-205.088 ± 13.708	-180.183 ± 22.170	-208.483 ± 35.583	252.459 ± 24.928	-20.722 ± 1.219
4.	ZINC49069570	-261.703 ± 26.106	-199.813 ± 18.640	-320.073 ± 47.593	279.613 ± 224.24	-21.429 ±1.083