Rapid structure based identification of potential Covid-19 main protease inhibitors

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Title: Rapid structure based identification of potential Covid-19 main protease inhibitors

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Abstract: “India fights Corona”, proclaims the media. ‘Stay home’, ‘social distancing’, ‘lock down’ are the phrases ringing in every home. The Corona pandemic has drawn the attention of many scientists to fight against the virus. We report herein, a set of newly identified molecules which can presumably act as potential inhibitors of Covid-19 main protease. A fast mode approach using a combinatorial structure based strategy which includes high throughput virtual screening, molecular docking, water map calculations and data base search was applied to identify these molecules. The PDB structures, 5R82, 6Y2G were used as the basis for this study. Data bases viz., Enamine, Drug Bank, Natural product, Specs and few antiviral drugs were used for screening. Water map analysis yielded insights into the design of more potential molecules. Considering the need of the hour, this study may help in the discovery and development of anti-viral drugs against Covid-19.

One Sentence Summary: Fast structure based combinatorial strategy was applied in this study to identify potential Covid-19 main protease inhibitors.

Introduction

The current Covid-19 pandemic challenges the very existence of life and will be remembered by the current generation forever. Since the beginning of the 21st century, the world has witnessed several viral epidemics. These are the severe acute respiratory syndrome coronavirus (SARS-CoV) in 2002, H1N1 Influenza virus in 2009, and the Middle East respiratory syndrome coronavirus (MERS-CoV) in 2012 [1].

In December 2019, a novel virus from the coronavirus family was identified in cases with viral pneumonia in Wuhan, in Hubei province of China. In Feb 2020, WHO officially named the disease as Covid-19 caused by novel Corona virus (2019-nCoV). The virus was further designated as Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) by the International Committee on Taxonomy of Viruses (ICTV) due to its 89.1% nucleotide similarity with the viral genome of severe acute respiratory syndrome coronavirus (SARS-CoV) [1, 2]. Coronaviruses (CoVs) are common in various other species including camels, cattle, cats and bats. Tyrell and Bonne had first reported the virus in 1966 from patients with common cold. Since then seven human CoVs have been isolated [3, 4]. CoVs are further classified into four subfamilies α , β , δ and γ . The α and β are reported to be originated from mammals such as bats while δ and γ originate from mostly pigs and birds [1, 5]. SARS-CoV, MERS-CoV, and SARS-CoV2 fall under the β subfamily. SARS-CoV-2 like the former two, affects the lower respiratory system causing viral pneumonia. It may also affect the gastrointestinal system, heart, kidney, liver, and central nervous system leading to multiple

organ failure [6, 7]. With more than 8,00,000 cases and 40,000 deaths as on 1st April 2020, this pandemic is posing a very serious public health risk. The SARS-CoV-2 is more contagious than SARS-CoV and MERS-CoV and has a basic reproduction number, R^0 between 2 to 2.5 [8, 9]. Although recent studies with small sample size have shown that hydroxychloroquine treatment reinforced by azithromycin is effective, the lack of specific drugs is a major need at this point of time [10].

CoVs are enveloped viruses, having a single-stranded positive sense RNA genome. They are large spherical viruses with a diameter of 80–120 nm and are studded with glycoprotein spikes that give them their crown-like appearance [11]. The RNA genome of CoVs, being one the largest, is susceptible to repeated recombination process, and thus can produce new strains with differences in virulence. The two-third part of the RNA genome is covered by the Open Reading Frame (ORF) 1a/b, which produces polyproteins1a and polyproteins1ab for viral replication. Sixteen other mature non-structural proteins including the main protease (M^{pro}) arise from further processing of these two polyproteins. The remaining one third part produces the structural proteins viz., spike (S) protein, membrane (M) protein, envelop (E) protein, nucleocapsid (N) protein, hemagglutinin esterase (HE) glycoprotein and other accessory proteins [12, 13].

The focus of the present study is to identify potential drug like molecules that inhibit the main protease of the virus, using the available crystal structure information in the literature. We followed a fast mode approach by using a combinatorial and structure based strategy to achieve this goal.

Crystal structure analysis of main protease (M^{pro}) inhibitors

Protein data bank reports several newly solved crystal structures for Co V [14]. Majority of them are found to be from Main protease (M^{pro}) and CoV spike (S) glycoprotein [15]. The main protease (M^{pro}), identified to be an important enzyme in the replication and transcription process of virus is an attractive target to design effective inhibitors for SARS-Co-V-2. The structural analyses of the available 13 crystal structures of M^{pro} revealed that the protein exists as a dimer [16]. In general, they comprise of three domains: Domain 1 (residues 8-101), Domain 2 (residues 102-184) and Domain 3 (residues 201-303). Domain 1 of both monomers are folded as a β -barrel whereas the Domain 2 of the both monomers are folded in β sheets. The final Domain 3 is connected to Domain 2 through a long loop in each monomer. The active site is occupied by the inhibitor and is bound between Domains 1 and 2 [17, 18]. The analysis also shows the binding pocket of the protein is electrically neutral consisting of approximately equal number of hydrophilic and hydrophobic residues. The comparative crystal structural analysis shows the importance of Gly143, Cys145, His41, Thr25, Met165, His163, His164, Glu166 and Pro168 in making H-bonds, hydrophobic and other interactions with the ligands [19, 20].

Results and Discussion

Molecular Docking

Subsequent to the structural analysis of protease structures, two crystal structure complexes (PDB IDs: 5R82, 6Y2G) were chosen for further computational studies [20, 21]. 5R82 is one of the high resolutions (1.3Å) crystal structures bound with a small ligand while 6Y2G (2.2Å) is the structure bound with a larger inhibitor, which was considered for molecular docking. A

total of 7,78,498 molecules from databases viz., Enamine [22], Natural product [22], Specs [23], and Drug Bank [24], were subjected to high throughput virtual screening (HTVS) procedure. In addition, 8 antiviral drug molecules were also considered for the study. The top scored 1000 molecules from HTVS were subjected to SP docking followed by 500 molecules for XP docking [25]. The binding mode of the molecules and the protein-ligand interactions were analyzed for the docked molecules. Many of the obtained hits show almost the same interactions as observed in the reference ligand of 6Y2G. Several molecules make hydrophobic interactions with the binding site residues. Figure 1 shows the stereo view of the protein-ligand interactions for a screened molecule whereas Fig. 2 shows the docked pose of the representative molecules from the data bases.

Figure 1. Stereo view of the protein-ligand interactions for a screened molecule (blue). Reference ligand in 6Y2G is shown in wire frame model (green). Hydrogen bonds and hydrophobic interactions are shown in yellow and green dotted lines.

Figure 2. Stereo view of docked poses of representative molecules from databases. The reference ligand in 6Y2G is shown in green. The protein is not displayed for clarity.

Water map Analysis

The prepared protein structures of 5R82 and 6Y2G were subjected for Watermap module of Schrödinger [26]. The generated maps with molecular surface for the two proteins are shown in Fig. 3A and Fig. 3B. The obtained ΔH , $-\Delta S$ and ΔG for both 5R82 and 6Y2G are given in Supplementary Table S1 and Table S2. Only the hydration sites, which fall within 5Å binding site of the ligands were considered for analysis. The displaceable hydration sites having both ΔG and $\Delta H \gg 0$ kcal/mol are identified as hydrophobic regions, which can be favorably displaced with suitable hydrophobic substitutions from the ligand. It is noted that the displacement of a single hydration site substantially contributes to the binding of the ligands thus explaining the hydrophobic collapse in molecular recognition process where waters squeeze out the hydrophobic residues so that hydrophobes will interact among themselves and waters will interact among themselves. Analysis of the water map of 5R82 shows two unstable waters in the vicinity of pyridine ring of the ligand which can be displaced either with methyl groups or halogens to make interactions with the neighboring residues (Fig. 3A). The enthalpy (ΔH), Entropy ($-\Delta S$) and free energy (ΔG) for the two water molecules, W1 and W2 are found to be 4.52, 0.95, 5.47 and 3.85, 1.11 and 4.96 kcal/mol respectively.

Hydration sites or the waters with $\Delta G > \sim 0$ and $\Delta H \ll 0$ kcal/mol can be considered for replacing with suitable functional groups that can make strong enthalpic interactions with the protein, provided, they are positioned with care. These water molecules interact with protein residues through hydrophilic interactions but pay an entropic penalty for this. So, these sites when replaced with polar functional groups as part of the ligands, can replace the polar interactions between the protein and water molecules. There are several such hydration sites suitable for replacement with polar groups (Fig. 4A and Fig. 4B, Table S1 and Table S2). There are also waters with $\Delta G \ll 0$, difficult to displace or replace but can make water bridged interactions with proteins. Also, the most stable hydration sites are shown in bright green balls with $\Delta G \ll 0$ which are a part of the conserved sites of protein and should be avoided while designing molecules.

In 5R82, there is a small scaffold in the binding site which can be further explored using the thermodynamic properties of the hydration sites for designing new molecules, whereas, in 6Y2G the ligand is larger in size and it occupies the whole binding site (Fig. 3B). Also, in 6Y2G, there are two unstable water molecules observed at a distance of 2Å from the propyl group and these sites can be further explored. The two unstable waters, W3 and W4 have enthalpy (ΔH), Entropy ($-\Delta S$) and free energy (ΔG) as 4.13, 2.77, 6.9 and 3.26, 2.24, 5.5 kcal/mol respectively. There are few more hydration sites which can be considered for replacement as per the thermodynamic parameters given. It was noted that many screened molecules are superimposing with the reference ligands and some of them show more significant binding affinity in terms of the calculated parameters.

Figure 3. Water maps for 5Å cavity of (A) 5R82 and (B) 6Y2G. Unstable waters are shown in red balls and reference ligands are shown in ball and stick.

Figures 4A and Fig. 4B show the water maps along with the binding site residues of 5R82 and 6Y2G respectively. The crystal waters of the structure are shown in stick model. It is interesting to note in both cases, the unstable water molecules as marked with white arrow are not coinciding with the crystal waters. These new hydration sites identified by the water maps can be used for displacement purposes. The water maps with labelled hydration sites for 5R82 and 6Y2G are given in Supplementary Fig. S1.

Figure 4. Stereo view showing the superposition of crystal waters and replaceable waters in (A) 5R82 (Top) and (B) 6Y2G (bottom). Crystal waters are shown in stick and reference ligands are shown in ball and stick model.

Identification of potential molecules

The top 100 molecules from XP docking using Glide module of Schrödinger were considered for MMGBSA calculation and water map scoring [25, 26]. The strategy followed in the study yielded many potential molecules representing different chemical classes. Also, these molecules were subjected for molecular descriptors calculation using QikProp module of Schrödinger [27]. The 2D structures of a few potential molecules obtained from the study are shown in Fig. 5. Table 1 provides a list of scores from XP docking, MMGBSA and water map calculations obtained. The scores for all 387 screened molecules are given in Supplementary Table S3. The QikProp results for the representative molecules are shown in Supplementary Table S4.

Figure 5. 2D Structure of top ranked docked molecules from different database

Table 1. List of scores obtained for representative molecules from XP docking, MMGBSA and water map calculations.

Sr. No.	Molecule ID	Docking score	Glide E model (kcal/mol)	Water Map ΔG (kcal/mol)	Water Map Enthalpy ΔH (kcal/mol)	Water Map Entropy (kcal/mol)	MMGBSA ΔG (kcal/mol)	WM/MM ΔG_{Bind} (kcal/mol)
Reference Ligand Complexed with 6Y2G								
-	REF-LIG-6Y2G	-8.547	-78.794	-29.157	1.884	-31.042	-109.77	-48.254
NATURAL PRODUCTS DATABASE								
NIPER1	ZINC67910471	-10.827	-77.023	-37.321	-5.654	-31.667	-100.14	-54.907
NIPER2	ZINC67910479	-9.275	-68.575	-34.826	-3.262	-31.564	-99.87	-54.03
NIPER3	ZINC67912526	-10.329	-72.442	-38.052	-10.289	-27.763	-73.82	-48.555
NIPER4	ZINC67912589	-9.989	-56.25	-34.984	-9.628	-25.357	-80.14	-47.549
NIPER5	ZINC67903197	-10.446	-57.295	-31.034	-5.293	-25.741	-90.38	-47.463
NIPER6	ZINC67910753	-9.828	-60.965	-31.042	-3.071	-27.971	-95.76	-47.396
DRUG BANK DATABASE								
NIPER77	DB01661	-13.719	-89.258	-32.703	-1.736	-30.967	-85.86	-53.774
NIPER78	DB13764	-13.639	-71.1	-25.135	6.093	-31.228	-83.64	-41.329

NIPER79	DB04023	-13.111	-82.224	-30.101	-6.71	-23.39	-66.09	-44.007
NIPER80	DB03041	-12.69	-79.432	-18.23	5.879	-24.109	-69.4	-34.776
NIPER81	DB04158	-12.569	-78.587	-24.281	4.721	-29.002	-71.59	-42.002
NIPER82	DB01792	-12.167	-76.115	-28.477	0.545	-29.021	-92.99	-50.464
ENAMINE DATABASE								
NIPER178	Z1899461190	-8.545	-51.633	-30.527	-8.289	-22.238	-76.1	-40.595
NIPER179	Z1344189646	-8.327	-37.492	-23.029	-6.603	-16.426	-62.05	-31.338
NIPER180	Z1951768720	-8.141	-43.679	-18.583	-2.212	-16.371	-63.04	-31.387
NIPER181	Z1443065604	-8.123	-50.44	-18.715	1.452	-20.167	-71.58	-31.455
NIPER182	Z2194546487	-7.88	-51.393	-18.151	1.809	-19.96	-54.94	-28.023
NIPER183	Z174805226	-7.97	-35.382	-15.304	0.265	15.04	-48.09	-21.314
SPECS DATABASE								
NIPER280	ZINC00641197	-8.466	-48.939	-22.037	-0.592	-21.445	-80.24	-37.713
NIPER281	ZINC00706449	-8.391	-48.026	-25.996	-4.394	-21.602	-71.59	-39.018
NIPER282	ZINC00679320	-8.315	-49.005	-27.361	-5.344	-22.018	-69.93	-40.764
NIPER283	ZINC00641249	-8.307	-51.04	-15.894	1.713	-17.607	-75.04	-29.738
NIPER284	ZINC08384151	-8.29	-58	-28.22	-4.854	-23.365	-80.57	-41.422
NIPER285	ZINC36044798	-8.224	-54.634	-21.027	0.455	-21.483	-76.03	-34.404
ANTI VIRALS								
NIPER381	RITONAVIR	-8.246	-82.859	-35.632	-0.968	-34.664	-100.95	-52.473
NIPER382	REMDESIVIR	-5.799	-54.926	-27.258	0.936	-28.194	-76.6	-38.846
NIPER383	AZITHROMYCIN	-5.621	-12.302	-9.888	8.156	-18.044	-78.91	-24.028
NIPER384	HYDROXY CHLOROQUINE	-5.083	-34.454	-20.539	-2.672	-17.867	-75.07	-32.388
NIPER385	FAVPIRAVIR	-4.732	-22.537	-11.816	-5.099	-6.717	-29.05	-18.683
NIPER386	LOPINAVIR	-4.226	-58.089	-24.963	4.932	-29.895	-86.11	-39.044

199

200 **Materials and Methods**

201

202 **3D-Databases preparation and Molecular docking**

203

204 Four databases namely Enamine [22], Specs [23], Natural product [23] and Drug bank [24]
 205 database and few anti-viral drugs were prepared and refined by removing duplicates, adding
 206 missing hydrogen atoms and subjected to molecular docking. The two proteins 6Y2G and
 207 5R82 were prepared using the Protein Preparation Wizard in Maestro [28] by adding the
 208 hydrogen atoms, optimizing hydrogen bonds, removing atomic clashes, adding formal
 209 charges to the hetero groups and then optimizing at neutral pH. Finally, the structure was
 210 minimized using Optimized Potential for Liquid Simulations-3e (OPLS-3e) force field. The
 211 molecules from the databases were retrieved in structure data file (SDF) format. The
 212 molecules were subjected to ligand preparation using Ligand Prep module of Schrodinger
 213 suite [29]. The ligand preparation process of molecules involves preserving the definite
 214 chirality, to generate minimum five low-energy stereoisomers per ligand, using default
 215 conditions at pH 7.0 ± 2.0. The crystal waters observed in the binding site of the proteins
 216 were retained for the molecular docking studies. The three-dimensional receptor interaction
 217 grid was generated at the centroid of the bound ligand in crystal structure of main protease
 218 COVID-19. The grid box was extended up to 10 Å as the inner box and 20 Å as the outer box

covering the entire binding site cavity completely. The prepared ligands were docked in the generated grids in the protein structures using HTVS (High Throughput Virtual Screening), Standard precision (SP), and extra precision (XP) docking program. Each of the poses were analyzed using protein-ligand interactions and different scores obtained [25].

MMGBSA calculation

Prime Molecular mechanics/generalized Born surface area (MM-GBSA) method [25] was used to calculate the binding free energy (ΔG_{bind}) of the ligand based on the docked complex.

Water map calculation

Water map is based on molecular dynamics simulations to describe thermodynamic properties of water molecules interacting with protein environment. Water map classifies water hydration sites into two categories namely stable water and unstable waters based on the thermodynamic properties like entropy ($-T\Delta S$), enthalpy ($-\Delta H$), free energy (ΔG). Stable water denotes hydration sites with negative free energy whereas the unstable water denotes hydration sites with positive free energy. In general, hydration sites with high positive values will provide different ways to improve the selectivity and potency of ligand. Water map consists of a pre-existing cavity in solution formed to accommodate the ligand. In order to allow ligand binding, the binding site waters get displaced to the cavity in solution, leaving a cavity of identical size and shape in the protein. The displaced solvent function in water map represents an attempt to estimate the free energy liberation (ΔG_{WM}) for the binding site waters into bulk solution upon cavity transfer between the two environments. The thermodynamic and structural properties of theoretical water molecules in the binding sites of 6Y2G were obtained from MD simulation of 2ns using water map [26].

ADME prediction using QikProp

A set of ADME-related properties (46 molecular descriptors) were calculated using the QikProp module [27]. This generates physically relevant descriptors, and uses them to perform ADME predictions. An overall ADME-compliance score – drug-likeness parameter (indicated by #stars), was used to assess the pharmacokinetic profiles of the compounds; other parameters like MW, QPlogPo/w, QPPCaco, QPlogBB, PHOA and RO5 were also calculated

Conclusions

The corona pandemic is rapidly spreading, raising concerns among many scientists from academia and industries as it must be fought scientifically which prompted us to perform this study. Herein, we report a set of newly identified molecules screened by a fast combinatorial strategy using the available structural information. Several molecules from natural product data base are promising which can be taken up for future studies. The molecules screened

from Drug Bank can be considered for repurposing of drugs. The recently much spoken hydroxychloroquine molecule in treating Co-V has also been picked up in the screening study. The Enamine and Specs data base molecules could be useful for researchers working in small molecule drug discovery. The results of water map calculations were used in the screening study and the analysis gives insight into the thermodynamic properties of the hydration sites in the binding site. An in-depth analysis of the hydration sites may bring forth more promising candidates. We believe, the identified molecules in this study will pave the way for the discovery and development of drugs for fighting the invisible enemy– The Corona Virus.

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Author Contributions

M.E.S designed the study. All the authors contributed for computations, analysis and preparation of manuscript.

Additional information

Competing interests

The authors declare no competing interests.

Supplementary information

Title: Rapid structure based identification of potential Covid-19 main protease inhibitors

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Figure S1. Representing water map labelled hydration sites of (A) 5R82 (Top) and (B) 6Y2G (Bottom) Water map Legend: Red-hydration sites = + ve ΔG , (free energy); Green hydration site= - ve ΔG ; Cyan to green hydration site means(Enthalpy) $\Delta H < -T\Delta S$ (Entropy); Green to yellow hydration state means $\Delta H > -T\Delta S$

Table S1. Thermodynamic parameters from water map calculations on PDB ID: 5R82

Site	ΔH	- $T\Delta S$	ΔG
1	-1.4	5.58	4.18
2	-0.97	3.42	2.45
3	2.56	4.82	7.38
4	-0.36	2.98	2.62
5	0.15	3.19	3.34
6	-1.07	2.64	1.57
7	-2.85	2.81	-0.04
8	0.67	2.43	3.1
9	-0.29	2.28	1.99
10	-1.13	2.41	1.28
11	-0.15	2.17	2.02
12	1.08	2.18	3.26
13	-2.29	2.47	0.18
14	-0.48	2.14	1.66
15	-0.6	2.44	1.84
16	1.7	1.97	3.67
17	-1.91	2.11	0.2
18	0.81	1.79	2.6
19	-1.57	1.99	0.42
20	0.93	1.83	2.76
21	-0.68	1.92	1.24
22	-0.16	1.59	1.43
23	-1.89	1.61	-0.28
24	0.25	1.69	1.94
25	0.47	1.61	2.08
26	-0.6	1.77	1.17
27	-0.99	1.49	0.5
28	-1.65	1.55	-0.1
29	-1.69	1.56	-0.13
30	-3.87	1.32	-2.55
31	-0.22	1.31	1.09
32	0.99	1.27	2.26
33	0.7	1.4	2.1
34	-0.55	1.26	0.71
35	-2.98	1.53	-1.45
36	-0.49	1.21	0.72
37	0.19	1.25	1.44
38	0.48	1.17	1.65
39	-0.97	1.14	0.17
40	-0.42	1.1	0.68
41	-0.12	1.1	0.98
42	3.85	1.11	4.96

43	-1.93	1.14	-0.79
44	0.47	1.05	1.52
45	-3.73	1.13	-2.6
46	1.14	1.06	2.2
47	0.64	1.06	1.7
48	0.83	1	1.83
49	1.4	1.02	2.42
50	-0.26	1.03	0.77
51	1.67	1	2.67
52	-1.89	1.18	-0.71
53	-0.21	0.96	0.75
54	-0.16	0.98	0.82
55	0.47	0.94	1.41
56	4.52	0.95	5.47
57	-0.21	0.87	0.66
58	-0.06	0.88	0.82
59	1.02	0.86	1.88
60	0.43	0.84	1.27
61	-1.1	0.86	-0.24
62	1.07	0.88	1.95
63	1.49	0.83	2.32
64	0.09	0.79	0.88
65	0.17	0.8	0.97
66	0.35	0.79	1.14
67	-0.28	0.78	0.5
68	0.66	0.73	1.39

Table S2. Thermodynamic parameters from water map calculations on PDB ID: 6Y2G

Site	ΔH	$-T\Delta S$	ΔG
1	-2.47	4.41	1.94
2	1.99	4.79	6.78
3	1.69	4.14	5.83
4	-0.65	3.67	3.02
5	-0.34	3.6	3.26
6	-1.33	3.4	2.07
7	-2.98	3.74	0.76
8	2.28	4.77	7.05
9	0.64	2.84	3.48
10	-1.8	3.01	1.21
11	4.13	2.77	6.9
12	0.07	3.13	3.2
13	-0.23	2.81	2.58
14	-2.82	3.18	0.36
15	-0.47	2.58	2.11
16	-0.81	2.64	1.83
17	2.48	2.62	5.1
18	-0.82	2.33	1.51
19	-1.02	2.6	1.58

20	1.17	2.62	3.79
21	3.26	2.24	5.5
22	0.03	2.49	2.52
23	-4.82	2.56	-2.26
24	-1.9	2.09	0.19
25	0.48	2.15	2.63
26	0.22	1.91	2.13
27	-0.3	1.91	1.61
28	0.25	2.14	2.39
29	0.23	1.91	2.14
30	0.23	1.95	2.18
31	-0.05	1.74	1.69
32	-1.44	1.66	0.22
33	0.41	1.77	2.18
34	-1.66	1.95	0.29
35	-1.01	1.45	0.44
36	-3.06	1.55	-1.51
37	1.01	1.5	2.51
38	0.24	1.52	1.76
39	0	1.52	1.52
40	-1.73	1.45	-0.28
41	-1.56	1.49	-0.07
42	-3.94	1.5	-2.44
43	-1.9	1.58	-0.32
44	-0.98	1.4	0.42
45	-1.75	1.44	-0.31
46	1.02	1.36	2.38
47	-3.26	1.4	-1.86
48	-0.95	1.44	0.49
49	-0.7	1.31	0.61
50	0.19	1.34	1.53
51	0.14	1.28	1.42
52	1.46	1.24	2.7
53	-0.28	1.27	0.99
54	-0.52	1.24	0.72
55	-0.77	1.35	0.58
56	-0.48	1.22	0.74
57	-0.28	1.29	1.01
58	-0.14	1.23	1.09
59	-0.43	1.2	0.77
60	0.97	1.24	2.21
61	-0.11	1.22	1.11
62	-0.8	1.16	0.36
63	1.99	1.16	3.15
64	-0.1	1.16	1.06
65	-0.65	1.12	0.47
66	-0.43	1.11	0.68
67	-0.14	1.13	0.99
68	0.81	1.08	1.89
69	-0.94	1.18	0.24

70	-0.99	1.23	0.24
71	-0.35	1.03	0.68
72	-0.33	1.06	0.73
73	-1.37	1.12	-0.25
74	1.26	1.18	2.44
75	0.59	1.05	1.64
76	0.16	1.02	1.18
77	0.31	1.05	1.36
78	-0.63	1.04	0.41
79	0.48	1.26	1.74
80	0.67	0.99	1.66
81	0.77	0.93	1.7
82	-0.08	1.06	0.98
83	0.53	0.98	1.51
84	-0.75	0.98	0.23
85	1.55	0.95	2.5
86	2.79	1.11	3.9
87	-0.81	0.93	0.12
88	-0.51	1.03	0.52
89	-1.2	0.94	-0.26
90	-1.23	0.94	-0.29
91	-0.39	0.95	0.56
92	0.65	0.85	1.5
93	1.85	0.91	2.76
94	-1.11	0.93	-0.18
95	0.32	0.85	1.17
96	1.02	0.89	1.91
97	0.58	0.89	1.47
98	2.43	0.84	3.27
99	-0.27	0.9	0.63
100	-1.43	0.91	-0.52
101	0.66	0.8	1.46
102	-0.33	0.91	0.58
103	-2.56	0.91	-1.65
104	0.29	0.84	1.13
105	-0.93	0.82	-0.11
106	0.83	0.82	1.65
107	-0.24	0.87	0.63
108	1.34	0.82	2.16
109	-3.12	0.93	-2.19
110	1.4	0.82	2.22
111	-0.17	0.81	0.64
112	-0.21	0.77	0.56
113	0.45	0.75	1.2
114	0.48	0.76	1.24
115	0.22	0.78	1
116	0.71	0.82	1.53
117	0.13	0.82	0.95
118	0.8	0.82	1.62
119	-0.63	0.76	0.13

120	-1.08	0.78	-0.3
121	-0.17	0.78	0.61
122	-0.43	0.76	0.33
123	-0.75	0.79	0.04

Table S3. List of scores obtained for 387 molecules

Sr. No.	Chemical Id	Dock score	Emodel	Water Map ΔG	Water Map Enthalpy	Water Map Entropy	MMGBSA ΔG	WM/MM $\Delta Bind$
NATURAL PRODUCTS DATABASE								
NIPER1	ZINC67910471	-10.827	-77.023	-37.321	-5.654	-31.667	-100.14	-54.907
NIPER2	ZINC67910479	-9.275	-68.575	-34.826	-3.262	-31.564	-99.87	-54.03
NIPER3	ZINC67912526	-10.329	-72.442	-38.052	-10.289	-27.763	-73.82	-48.555
NIPER4	ZINC67912589	-9.989	-56.25	-34.984	-9.628	-25.357	-80.14	-47.549
NIPER5	ZINC67903197	-10.446	-57.295	-31.034	-5.293	-25.741	-90.38	-47.463
NIPER6	ZINC67910753	-9.828	-60.965	-31.042	-3.071	-27.971	-95.76	-47.396
NIPER7	ZINC67912528	-11.083	-79.123	-24.998	0.053	-25.051	-104.16	-46.969
NIPER8	ZINC15112222	-7.333	-54.952	-30.27	-5.488	-24.782	-87.09	-45.919
NIPER9	ZINC67902754	-9.664	-79.49	-37.345	-3.614	-33.731	-68.2	-45.803
NIPER10	ZINC15676330	-7.626	-68.905	-25.929	-1.831	-24.097	-83.17	-44.927
NIPER11	ZINC38143828	-10.296	-76.267	-27.824	2.209	-30.034	-93.02	-44.789
NIPER12	ZINC31167288	-10.397	-54.516	-31.582	-9.43	-22.152	-83.08	-44.41
NIPER13	ZINC31167292	-10.397	-54.516	-31.582	-9.43	-22.152	-83.08	-44.41
NIPER14	ZINC08624572	-8.355	-59.672	-23.415	0.392	-23.807	-91.09	-42.718
NIPER15	ZINC20465660	-7.139	-55.858	-23.951	1.913	-25.864	-97.2	-42.717
NIPER16	ZINC49898130	-10.886	-57.75	-29.591	-5.593	-23.998	-83.56	-42.567
NIPER17	ZINC01650233	-8.615	-55.564	-30.161	-5.212	-24.949	-77.8	-42.303
NIPER18	ZINC67903429	-9.166	-89.219	-29.598	3.402	-32.999	-84.66	-42.067
NIPER19	ZINC67902943	-13.325	-64.383	-25.617	-0.835	-24.782	-92.2	-42.009
NIPER20	ZINC67903024	-10.752	-67.48	-30.086	-7.348	-22.738	-69.36	-41.916
NIPER21	ZINC38143830	-10.436	-73.617	-25.63	3.366	-28.997	-90.84	-41.673
NIPER22	ZINC67911281	-9.278	-74.79	-24.844	4.279	-29.123	-91.27	-41.384
NIPER23	ZINC04216676	-9.146	-70.893	-24.714	3.447	-28.161	-89.06	-41.344
NIPER24	ZINC67902879	-11.363	-69.663	-21.974	5.81	-27.784	-96.5	-41.212
NIPER25	ZINC15676365	-7.125	-68.27	-22.109	-0.407	-21.702	-87.15	-41.185
NIPER26	ZINC59677186	-7.085	-66.493	-32.649	-6.513	-26.136	-65.62	-40.961
NIPER27	ZINC08643408	-8.43	-51.448	-28.043	-9.624	-18.419	-83.18	-40.706
NIPER28	ZINC67911491	-8.191	-78.278	-25.795	6.564	-32.36	-85.35	-40.49
NIPER29	ZINC67913779	-9.92	-54.936	-34.167	-8.583	-25.584	-62.13	-40.283
NIPER30	ZINC67910479	-11.017	-75.117	-27.779	4.331	-32.11	-84.02	-40.171
NIPER31	ZINC67902469	-12.815	-65.005	-21.733	1.828	-23.561	-98.68	-40.131
NIPER32	ZINC67912581	-9.116	-68.425	-29.527	-2.468	-27.058	-73.42	-39.823
NIPER33	ZINC38139530	-10.881	-67.681	-25.858	3.003	-28.861	-82.11	-39.223
NIPER34	ZINC04096846	-12.151	-76.958	-25.003	5.16	-30.163	-79.81	-39.105
NIPER35	ZINC33861403	-10.47	-59.579	-24.63	-0.856	-23.774	-74.05	-38.748
NIPER36	ZINC35455223	-9.454	-59.772	-23.404	0.382	-23.786	-82.21	-38.671
NIPER37	ZINC67911292	-11.669	-57.584	-24.426	-2.713	-21.713	-85.29	-38.532
NIPER38	ZINC31167122	-10.166	-61.505	-24.313	-2.459	-21.854	-73.82	-38.229
NIPER39	ZINC67911231	-11.147	-70.213	-21.894	5.255	-27.149	-81.41	-37.967
NIPER40	ZINC67903231	-9.133	-53.45	-27.662	-4.479	-23.182	-92.05	-37.862
NIPER41	ZINC05433680	-7.086	-67.289	-26.132	-3.529	-22.603	-66.64	-37.531
NIPER42	ZINC67910695	-8.915	-61.94	-24.465	7.391	-31.857	-78.71	-37.347
NIPER43	ZINC38139797	-8.65	-57.332	-22.023	7.385	-29.407	-85.66	-37.268
NIPER44	ZINC31153552	-7.558	-49.83	-30.324	-11.62	-18.704	-54.09	-37.202
NIPER45	ZINC67903429	-7.131	-66.707	-24.666	4.056	-28.722	-76.52	-36.722
NIPER46	ZINC67902657	-12.791	-69.815	-29.144	0.107	-29.251	-65.82	-36.471
NIPER47	ZINC15675744	-7.308	-67.808	-18.912	6.299	-25.211	-81.67	-35.17

NIPER48	ZINC67912583	-8.188	-70.994	-25.209	5.034	-30.243	-60.18	-35.063
NIPER49	ZINC04098556	-10.341	-67.357	-19.734	5.388	-25.122	-77.01	-34.853
NIPER50	ZINC35456617	-7.265	-50.711	-26.107	-7.303	-18.804	-63.01	-34.833
NIPER51	ZINC67911489	-10.483	-85.259	-18.821	10.408	-29.229	-85.44	-34.751
NIPER52	ZINC00844289	-8.159	-46.508	-21.928	-3.075	-18.853	-66.44	-34.74
NIPER53	ZINC67902860	-9.072	-61.669	-23.407	4.409	-27.816	-71.44	-34.734
NIPER54	ZINC67912395	-9.326	-68.944	-27.608	1.53	-29.138	-55.65	-34.364
NIPER55	ZINC15676330	-7.277	-70.541	-17.956	3.131	-21.087	-74.01	-33.821
NIPER56	ZINC38139526	-11.136	-67.883	-26.648	3.896	-30.544	-62.38	-33.809
NIPER57	ZINC67912393	-10.267	-64.501	-24.814	1.558	-26.372	-69.54	-33.671
NIPER58	ZINC49898792	-11.538	-79.971	-16.364	9.776	-26.14	-82.31	-33.438
NIPER59	ZINC67903250	-10.113	-68.289	-20.62	7.729	-28.35	-70.31	-33.402
NIPER60	ZINC12360166	-7.083	-69.484	-15.968	5.459	-21.428	-80.31	-32.883
NIPER61	ZINC35455270	-9.615	-57.208	-20.485	1.007	-21.492	-78.37	-32.325
NIPER62	ZINC38143762	-11.142	-68.177	-23.16	6.956	-30.116	-73.5	-32.323
NIPER63	ZINC05433814	-7.015	-67.596	-18.252	3.945	-22.198	-75.95	-32.12
NIPER64	ZINC67902883	-10.571	-68.111	-16.501	8.419	-24.921	-80.88	-32.09
NIPER65	ZINC30879455	-7.909	-51.036	-21.834	1.128	-22.962	-68.04	-31.85
NIPER66	ZINC31165292	-11.152	-70	-19.067	3.261	-22.328	-71.97	-31.835
NIPER67	ZINC67912659	-8.423	-68.113	-19.956	3.847	-23.804	-75.97	-31.726
NIPER68	ZINC67903538	-8.907	-77.039	-31.542	-2.616	-28.926	-34.95	-30.905
NIPER69	ZINC02106570	-6.971	-41.04	-18.673	-6.417	-12.256	-50.46	-30.532
NIPER 70	ZINC14687876	-7.699	-45.067	-17.852	0.112	-17.964	-69.5	-29.492
NIPER71	ZINC01639355	-7.881	-38.194	-19.011	-4.343	-14.668	-56.14	-27.781
NIPER72	ZINC14687903	-7.423	-45.979	-16.641	0.406	-17.047	-64.95	-26.452
NIPER73	ZINC08627147	-8.999	-55.337	-11.404	7.67	-19.074	-63.66	-21.891
NIPER74	ZINC20463331	-8.002	-56.978	-14.794	5.289	-20.083	-57.93	-21.099
NIPER75	ZINC19800831	-8.019	-55.319	-11.288	9.084	-20.372	-52.5	-20.396
NIPER76	ZINC36521966	-7.519	-46.5	-4.523	10.625	-15.148	-57.01	-19.189
DRUG BANK DATABASE								
NIPER77	DB01661	-13.719	-89.258	-32.703	-1.736	-30.967	-85.86	-53.774
NIPER78	DB13764	-13.639	-71.1	-25.135	6.093	-31.228	-83.64	-41.329
NIPER79	DB04023	-13.111	-82.224	-30.101	-6.71	-23.39	-66.09	-44.007
NIPER80	DB03041	-12.69	-79.432	-18.23	5.879	-24.109	-69.4	-34.776
NIPER81	DB04158	-12.569	-78.587	-24.281	4.721	-29.002	-71.59	-42.002
NIPER82	DB01792	-12.167	-76.115	-28.477	0.545	-29.021	-92.99	-50.464
NIPER83	DB02547	-12.125	-69.529	-26.237	-2.371	-23.866	-75.32	-43.062
NIPER84	DB01698	-12.064	-68.2	-25.834	2.146	-27.98	-35.1	-24.537
NIPER85	DB12410	-12.035	-58.293	-32.697	-10.556	-22.14	-80.09	-44.571
NIPER86	DB02358	-12.026	-71.611	-26.422	-4.526	-21.896	-66.75	-41.665
NIPER87	DB03186	-11.959	-89.796	-24.571	4.366	-28.937	-83.12	-46.06
NIPER88	DB04882	-11.849	-69.03	-23.372	2.981	-26.353	-99.91	-41.939
NIPER89	DB04099	-11.826	-76.283	-16.431	8.984	-25.415	-75.97	-32.974
NIPER90	DB03397	-11.796	-70.826	-13.972	7.906	-21.877	-84.6	-32.536
NIPER91	DB04226	-11.718	-55.023	-16.659	4.28	-20.939	-71.45	-28.631
NIPER92	DB01690	-11.689	-74.687	-22.686	-0.554	-22.131	-35.49	-29.227
NIPER93	DB02059	-11.299	-68.488	-22.789	0.164	-22.953	-67.98	-37.181
NIPER94	DB03461	-11.134	-82.427	-12.647	13.817	-26.464	-62.5	-24.127
NIPER95	DB03755	-11.079	-68.042	-9.565	11.188	-20.753	-70.11	-28.195
NIPER96	DB03956	-11.079	-54.233	-3.957	12.41	-16.367	-65.24	-20.568
NIPER97	DB03296	-11.065	-48.876	-29.907	-7.006	-22.9	-77.96	-43.855
NIPER98	DB00157	-10.926	-76.658	-13.523	13.123	-26.645	-50.04	-23.625
NIPER99	DB02196	-10.847	-66.944	-23.273	-0.802	-22.471	-84.62	-43.042
NIPER100	DB04482	-10.758	-57.829	-17.97	4.86	-22.83	-70.91	-32.191
NIPER101	DB04651	-10.715	-65.383	-32.542	-9.302	-23.241	-85.5	-48.953
NIPER102	DB03751	-10.626	-66.687	-19.031	3.481	-22.512	-79.15	-36.428
NIPER103	DB02498	-10.617	-82.885	-30.405	-0.291	-30.114	-81.55	-46.227
NIPER104	DB03161	-10.574	-63.226	-18.774	2.555	-21.328	-76.93	-36.675
NIPER105	DB02554	-10.49	-74.828	-12.671	11.666	-24.337	-57.07	-24.452
NIPER106	DB04418	-10.407	-59.214	-23.536	-3.642	-19.895	-57.87	-37.701

NIPER107	DB02319	-10.33	-76.51	-19.273	11.01	-30.283	-63.56	-30.22
NIPER108	DB08237	-10.303	-70.817	-25.207	-0.498	-24.709	-72.03	-40.122
NIPER109	DB04983	-10.219	-74.876	-17.795	9.652	-27.447	-51.67	-29.678
NIPER110	DB03797	-10.21	-77.118	-14.346	13.714	-28.06	-65.7	-27.927
NIPER111	DB04421	-10.207	-77.698	-18.932	2.078	-21.01	-47	-26.645
NIPER112	DB01975	-10.148	-75.919	-12.142	10.943	-23.085	-64.13	-26.522
NIPER113	DB03687	-10.137	-56.826	-23.529	-1.841	-21.689	-68.08	-38.223
NIPER114	DB03022	-10.128	-53.566	-31.555	-12.082	-19.473	-83.23	-51.623
NIPER115	DB03532	-10.041	-74.642	-21.218	-2.013	-19.205	-54.73	-33.858
NIPER116	DB02338	-9.882	-80.152	-14.635	11.082	-25.717	-63.36	-28.628
NIPER117	DB11616	-9.882	-60.628	-33.347	-12.525	-20.822	-66	-40.74
NIPER118	DB11670	-9.855	-60.253	-20.336	3.774	-24.109	-74.25	-33.763
NIPER119	DB12052	-9.851	-60.383	-23.396	1.836	-25.232	-84.18	-37.759
NIPER120	DB01960	-9.802	-55.281	-18.407	-1.685	-16.722	-60.89	-32.682
NIPER121	DB02629	-9.774	-74.653	-34.744	-0.272	-34.472	-91.3	-48.515
NIPER122	DB04097	-9.692	-56.346	-17.795	2.498	-20.293	-65.47	-31.126
NIPER123	DB02557	-9.658	-72.613	-24.407	2.415	-26.822	-73.77	-37.433
NIPER124	DB12937	-9.602	-47.465	-20.68	-2.549	-18.131	-47.17	-28.683
NIPER125	DB04408	-9.591	-62.362	-26.136	5.581	-31.717	-89.65	-40.947
NIPER126	DB00158	-9.5	-62.063	-20.607	4.192	-24.799	-68.92	-34.261
NIPER127	DB04514	-9.499	-73.246	-26.015	-3.727	-22.288	-65.54	-39.98
NIPER128	DB02732	-9.462	-68.757	-19.802	8.235	-28.037	-60.55	-30.326
NIPER129	DB02651	-9.439	-78.197	-26.094	3.381	-29.475	-69.35	-38.656
NIPER130	DB15246	-9.434	-66.799	-26.583	-0.345	-26.239	-57.87	-35.516
NIPER131	DB03300	-9.427	-80.201	-13.923	7.532	-21.455	-74.32	-30.756
NIPER132	DB01177	-9.39	-57.61	-25.057	-2.033	-23.024	-76.83	-38.78
NIPER133	DB03812	-9.379	-53.816	-15.142	7.072	-22.213	-58.42	-27.039
NIPER134	DB01864	-9.344	-62.215	-20.615	2.493	-23.108	-66.64	-38.116
NIPER135	DB04121	-9.263	-67.278	-5.048	13.951	-18.999	-65.83	-22.747
NIPER136	DB08185	-9.26	-62.572	-21.832	0.758	-22.59	-83.55	-37.36
NIPER137	DB03962	-9.234	-70.523	-19.151	7.163	-26.314	-80.12	-38.386
NIPER138	DB11184	-9.119	-61.467	-25.919	-1.557	-24.362	-77.05	-39.098
NIPER139	DB04396	-9.042	-42.069	-23.951	-6.321	-17.63	-78.66	-38.196
NIPER140	DB03714	-9.017	-59.527	-24.378	-2.758	-21.619	-78.31	-42.249
NIPER141	DB02098	-8.955	-57.828	-15.97	2.9	-18.87	-63.79	-33.145
NIPER142	DB12665	-8.949	-54.701	-15.519	7.068	-22.587	-73.22	-30.906
NIPER143	DB09421	-8.893	-55.286	-20.307	-2.827	-17.48	-60.25	-30.772
NIPER144	DB03638	-8.827	-65.461	-23.78	-0.271	-23.509	-55.47	-32.17
NIPER145	DB04461	-8.808	-74.672	-27.865	-2.095	-25.77	-78.13	-41.122
NIPER146	DB01831	-8.746	-58.357	-14.265	5.149	-19.414	-66.76	-30.307
NIPER147	DB05616	-8.746	-57.166	-24.52	-4.296	-20.223	-61.84	-35.665
NIPER148	DB04096	-8.719	-39.791	-20.921	-2.342	-18.579	-77.32	-38.141
NIPER149	DB01893	-8.711	-67.626	-21.547	3.857	-25.405	-71.18	-37.202
NIPER150	DB13490	-8.679	-61.095	-29.197	-0.446	-28.751	-62.54	-37.194
NIPER151	DB11296	-8.672	-57.619	-19.411	2.288	-21.699	-53.39	-29.348
NIPER152	DB07409	-8.548	-59.768	-20.938	-2.801	-18.137	-70.72	-35.656
NIPER153	DB03160	-8.503	-55.337	-26.774	-4.456	-22.318	-87.8	-44.392
NIPER154	DB04438	-8.481	-49.27	-13.307	2.199	-15.505	-45.41	-20.522
NIPER155	DB00452	-8.458	-48.754	-17.711	8.667	-26.378	-58.28	-25.526
NIPER156	DB12757	-8.371	-58.283	-28.751	-3.911	-24.84	-71.51	-40.881
NIPER157	DB03823	-8.363	-40.55	-12.036	4.1	-16.136	-49.16	-20.783
NIPER158	DB03247	-8.347	-52.416	-12.943	7.357	-20.3	-56.01	-22.008
NIPER159	DB02224	-8.34	-37.068	-20.933	-6.25	-14.683	-55.63	-31.735
NIPER160	DB14772	-8.307	-52.113	-25.25	-6.311	-18.939	-72.61	-38.279
NIPER161	DB04789	-8.305	-62.31	-25.956	-4.438	-21.518	-64.41	-38.461
NIPER162	DB14636	-8.299	-48.775	-16.651	0.662	-17.313	-67.37	-32.52
NIPER163	DB02483	-8.266	-75.552	-26.037	4.139	-30.176	-76.95	-40.855
NIPER164	DB03973	-8.242	-65.289	-17.919	5.372	-23.292	-58.87	-30.473
NIPER165	DB02082	-8.238	-65.673	-11.719	9.887	-21.606	-54.71	-25.94
NIPER166	DB01700	-8.181	-54.962	-9.154	7.036	-16.19	-43.83	-20.114

NIPER167	DB12441	-8.16	-62.804	-18.852	9.308	-28.16	-63.64	-28.936
NIPER168	DB02540	-8.153	-65.283	-16.863	8.623	-25.487	-81.1	-35.365
NIPEE169	DB06866	-8.117	-47.52	-31.89	-11.335	-20.555	-72.49	-41.697
NIPER170	DB03148	-8.094	-52.593	-8.934	7.164	-16.098	-55.96	-22.526
NIPER171	DB12895	-8.048	-56.911	-25.983	5.254	-31.237	-87.07	-38.705
NIPER172	DB12977	-8.004	-50.461	-28.719	-2.522	-26.197	-92.09	-44.729
NIPER173	DB00224	-7.998	-56.455	-30.784	-6.325	-24.459	-86.5	-42.537
NIPER174	DB01995	-7.985	-47.129	-14.087	2.008	-16.096	-60.08	-28.845
NIPER175	DB01812	-7.955	-51.385	-17.477	-0.034	-17.442	-55.61	-32.194
NIPER176	DB02333	-7.953	-54.905	-16.301	4.386	-20.687	-70.71	-36.131
NIPER177	DB04014	-7.945	-39.455	-19.83	-4.369	-15.461	-53.86	-29.253
ENAMINE DATABASE								
NIPER178	Z1899461190	-8.545	-51.633	-30.527	-8.289	-22.238	-76.1	-40.595
NIPER179	Z1344189646	-8.327	-37.492	-23.029	-6.603	-16.426	-62.05	-31.338
NIPER180	Z1951768720	-8.141	-43.679	-18.583	-2.212	-16.371	-63.04	-31.387
NIPER181	Z1443065604	-8.123	-50.44	-18.715	1.452	-20.167	-71.58	-31.455
NIPER182	Z2194546487	-7.88	-51.393	-18.151	1.809	-19.96	-54.94	-28.023
NIPER183	Z1748052226	-7.797	-35.382	-15.304	-0.265	-15.04	-48.09	-21.314
NIPER184	Z1748052226	-7.797	-35.382	-15.304	-0.265	-15.04	-48.09	-21.314
NIPER185	Z1443065604	-7.702	-47.817	-24.023	-1.487	-22.536	-73.57	-36.393
NIPER186	Z1899473976	-7.693	-45.222	-25.618	-7.092	-18.525	-69.41	-34.139
NIPER187	Z3635404747	-7.677	-54.886	-21.617	-1.688	-19.929	-81.57	-37.083
NIPER188	Z1698911037	-7.666	-47.73	-24.049	-3.201	-20.849	-72.81	-34.834
NIPER189	Z1522274835	-7.654	-48.366	-22.368	-4.202	-18.166	-72.61	-31.65
NIPER190	Z3649466605	-7.579	-62.447	-37.603	-7.445	-30.157	-105.96	-53.387
NIPER191	Z3062886118	-7.562	-56.623	-24.894	-0.021	-24.873	-89.08	-41.144
NIPER192	Z3062886118	-7.562	-56.623	-24.894	-0.021	-24.873	-89.08	-41.144
NIPER193	Z3242334951	-7.552	-37.178	-21.41	-6.245	-15.164	-48.36	-30.563
NIPER194	Z1217457777	-7.54	-47.216	-22.649	-6.121	-16.529	-75.67	-37.101
NIPER195	Z1904515500	-7.489	-43.749	-20.561	-2.213	-18.348	-70.61	-34.207
NIPER196	Z1904515500	-7.489	-43.749	-20.561	-2.213	-18.348	-70.61	-34.207
NIPER197	Z1904515500	-7.489	-43.749	-20.561	-2.213	-18.348	-70.61	-34.207
NIPER198	Z1904515500	-7.489	-43.749	-20.561	-2.213	-18.348	-70.61	-34.207
NIPER199	Z2798426411	-7.489	-45.269	-25.12	-6.046	-19.074	-75.5	-34.868
NIPER200	Z2798426411	-7.489	-45.269	-25.12	-6.046	-19.074	-75.5	-34.868
NIPER201	Z3040093352	-7.486	-38.44	-29.144	-13.404	-15.741	-67.08	-41.673
NIPER202	Z3040093352	-7.486	-38.44	-29.144	-13.404	-15.741	-67.08	-41.673
NIPER203	Z1422257462	-7.476	-43.487	-21.559	-2.633	-18.926	-72.9	-33.017
NIPER204	Z1688669918	-7.431	-47.577	-24.099	-4.512	-19.588	-65.89	-37.626
NIPER205	Z2788449789	-7.414	-45.226	-26.74	-7.166	-19.573	-73.34	-39.032
NIPER206	Z3210945312	-7.373	-31.584	-19.138	-6.137	-13.001	-63.4	-28.463
NIPER207	Z3464484385	-7.365	-48.712	-30.893	-9.714	-21.179	-84.81	-46.475
NIPER208	Z1932170341	-7.363	-53.425	-20.157	0.936	-21.093	-80.98	-34.125
NIPER209	Z2873129857	-7.361	-35.419	-17.721	-5.168	-12.553	-58.14	-27.176
NIPER210	Z2482017188	-7.358	-43.34	-18.772	-0.737	-18.035	-46.59	-27.115
NIPER211	Z2482017188	-7.358	-43.34	-18.772	-0.737	-18.035	-46.59	-27.115
NIPER212	Z1411786551	-7.337	-48.441	-26.777	-4.395	-22.382	-71.45	-38.545
NIPER213	Z3664687470	-7.33	-41.57	-23.324	-5.089	-18.235	-62.54	-34.683
NIPER214	Z1522025926	-7.275	-42.432	-21.013	-4.598	-16.415	-69.88	-29.436
NIPER215	Z1870021901	-7.259	-50.211	-23.244	-9.535	-13.709	-48.81	-31.332
NIPER216	Z770161780	-7.254	-43.336	-19.826	-0.582	-19.244	-58.62	-29.423
NIPER217	Z1370795512	-7.247	-43.442	-26.616	-9.423	-17.193	-52.09	-31.263
NIPER218	Z1723437505	-7.229	-46.906	-22.125	-1.477	-20.648	-75.65	-37.358
NIPER219	Z1723437505	-7.229	-46.906	-22.125	-1.477	-20.648	-75.65	-37.358
NIPER220	Z1442891551	-7.228	-51.887	-22.77	-4.482	-18.288	-72.28	-35.229
NIPER221	Z1442891551	-7.228	-51.887	-22.77	-4.482	-18.288	-72.28	-35.229
NIPER222	Z1615665435	-7.213	-44.277	-20.194	-1.751	-18.443	-72.81	-32.54
NIPER223	Z1141894386	-7.211	-38.067	-23.951	-8.659	-15.292	-53.33	-32.825
NIPER224	Z1141894386	-7.211	-38.067	-23.951	-8.659	-15.292	-53.33	-32.825
NIPER225	Z3615437914	-7.196	-47.799	-30.019	-9.196	-20.823	-79.07	-45.632

NIPER226	Z1747853639	-7.192	-41.593	-23.351	-3.563	-19.788	-65.64	-36.053
NIPER227	Z1870021901	-7.15	-53.489	-21.612	-5.863	-15.749	-44.9	-28.079
NIPER228	Z1870021901	-7.15	-53.489	-21.612	-5.863	-15.749	-44.9	-28.079
NIPER229	Z1870021901	-7.15	-53.489	-21.612	-5.863	-15.749	-44.9	-28.079
NIPER230	Z1984431740	-7.149	-36.118	-23.265	-5.8	-17.465	-45.27	-30.438
NIPER231	Z2961486187	-7.144	-53.291	-24.435	-2.464	-21.971	-78.99	-38.653
NIPER232	Z2528665912	-7.092	-32.288	-23.01	-6.614	-16.396	-47.71	-29.689
NIPER233	Z2528665912	-7.092	-32.288	-23.01	-6.614	-16.396	-47.71	-29.689
NIPER234	Z1315856390	-7.087	-38.407	-19.678	-2.902	-16.775	-57.77	-30.355
NIPER235	Z1229943565	-7.08	-46.844	-27.824	-7.76	-20.064	-70.03	-41.075
NIPER236	Z3015132220	-7.075	-46.858	-23.821	-2.906	-20.915	-59.32	-31.814
NIPER237	Z2788447560	-7.058	-45.96	-22.601	-6.591	-16.01	-61.05	-33.263
NIPER238	Z1474147457	-7.052	-40.238	-22.65	-4.213	-18.437	-68.1	-35.445
NIPER239	Z1474147457	-7.052	-40.238	-22.65	-4.213	-18.437	-68.1	-35.445
NIPER240	Z2959870623	-7.042	-43.431	-20.986	-2.5	-18.486	-63.84	-33.03
NIPER241	Z2959870623	-7.042	-43.431	-20.986	-2.5	-18.486	-63.84	-33.03
NIPER242	Z1723430650	-7.012	-48.557	-26.395	-3.605	-22.79	-65.6	-37.719
NIPER243	Z1723430650	-7.012	-48.557	-26.395	-3.605	-22.79	-65.6	-37.719
NIPER244	Z1474144239	-7.003	-39.271	-25.019	-9.524	-15.494	-62.58	-38.626
NIPER245	Z1474144239	-7.003	-39.271	-25.019	-9.524	-15.494	-62.58	-38.626
NIPER246	Z2044060381	-6.997	-45.269	-24.866	-4.987	-19.88	-63.31	-30.818
NIPER247	Z2061541512	-6.982	-48.323	-20.323	-2.752	-17.57	-64.82	-31.398
NIPER248	Z1331536923	-6.972	-35.97	-20.216	-5.227	-14.989	-59.52	-31.609
NIPER249	Z2788449789	-6.97	-45.617	-26.9	-5.933	-20.967	-67.32	-37.59
NIPER250	Z2005529559	-6.961	-35.531	-22.897	-7.079	-15.818	-69.87	-37.89
NIPER251	Z1869984537	-6.958	-41.51	-23.859	-4.322	-19.538	-67.48	-34.173
NIPER252	Z1869984537	-6.958	-41.51	-23.859	-4.322	-19.538	-67.48	-34.173
NIPER253	Z2005156965	-6.956	-44.717	-18.337	0.373	-18.71	-68.55	-31.223
NIPER254	Z3041580464	-6.941	-37.407	-24.045	-5.837	-18.209	-62.11	-32.642
NIPER255	Z341776266	-6.928	-54.433	-26.261	-5.638	-20.623	-60.08	-38.306
NIPER256	Z1444778233	-6.889	-37.668	-21.492	-4.061	-17.431	-36.07	-23.496
NIPER257	Z2178138706	-6.889	-47.113	-26.936	-11.408	-15.529	-51.67	-37.112
NIPER258	Z2178138706	-6.889	-47.113	-26.936	-11.408	-15.529	-51.67	-37.112
NIPER259	Z3062879805	-6.877	-50.99	-17.947	3.414	-21.361	-80.46	-32.013
NIPER260	Z3062879805	-6.877	-50.99	-17.947	3.414	-21.361	-80.46	-32.013
NIPER261	Z1497727961	-6.875	-41.406	-23.87	-4.396	-19.474	-64.62	-34.762
NIPER262	Z751406438	-6.874	-50.669	-22.913	-0.328	-22.585	-90.95	-37.46
NIPER263	Z1748054572	-6.873	-38.468	-21.545	-6.717	-14.828	-58.57	-32.631
NIPER264	Z3062887599	-6.871	-48.22	-20.343	3.005	-23.348	-90.8	-38.523
NIPER265	Z3062887599	-6.871	-48.22	-20.343	3.005	-23.348	-90.8	-38.523
NIPER266	Z2087848899	-6.836	-36.62	-16.816	-1.803	-15.013	-51.63	-25.535
NIPER267	Z341776266	-6.835	-51.832	-24.086	-2.856	-21.229	-58.24	-35.685
NIPER268	Z1972782733	-6.829	-43.309	-14.406	-0.731	-13.674	-66.01	-27.008
NIPER269	Z1025446834	-6.82	-36.922	-15.714	-3.804	-11.909	-57.46	-27.115
NIPER270	Z1974971668	-6.799	-50.81	-25.827	-1.747	-24.08	-73.87	-39.872
NIPER271	Z849671072	-6.776	-35.659	-32.025	-13.31	-18.715	-47.19	-36.349
NIPER272	Z1890693129	-6.743	-34.596	-16.358	-1.146	-15.212	-59.38	-26.589
NIPER273	Z1890693129	-6.743	-34.596	-16.358	-1.146	-15.212	-59.38	-26.589
NIPER274	Z2972322701	-6.725	-32.372	-14.29	4.304	-18.594	-58.92	-24.283
NIPER275	Z2972322701	-6.725	-32.372	-14.29	4.304	-18.594	-58.92	-24.283
NIPER275	Z1265558714	-6.715	-52.509	-23.966	-1.88	-22.087	-79.73	-37.548
NIPER276	Z3290580018	-6.715	-48.38	-18.208	-0.827	-17.381	-69.91	-31.445
NIPER277	Z1609531046	-6.711	-50.462	-24.977	-4.057	-20.92	-65.78	-35.474
NIPER278	Z3062884818	-6.693	-46.868	-18.227	3.444	-21.67	-85.63	-35.327
SPECS DATABASE								
NIPER279	ZINC00641197	-8.466	-48.939	-22.037	-0.592	-21.445	-80.24	-37.713
NIPER281	ZINC00706449	-8.391	-48.026	-25.996	-4.394	-21.602	-71.59	-39.018
NIPER282	ZINC00679320	-8.315	-49.005	-27.361	-5.344	-22.018	-69.93	-40.764
NIPER283	ZINC00641249	-8.307	-51.04	-15.894	1.713	-17.607	-75.04	-29.738
NIPER284	ZINC08384151	-8.29	-58	-28.22	-4.854	-23.365	-80.57	-41.422

NIPER285	ZINC36044798	-8.224	-54.634	-21.027	0.455	-21.483	-76.03	-34.404
NIPER286	ZINC13942028	-8.132	-58.947	-36.324	-13.557	-22.767	-25.57	-34.831
NIPER287	ZINC00641233	-8.112	-52.475	-20.703	-0.443	-20.26	-77.9	-36.424
NIPER288	ZINC06645813	-8.089	-48.023	-25.896	-4.629	-21.267	-88.78	-39.522
NIPER289	ZINC00706470	-8.083	-49.254	-23.475	-0.245	-23.23	-79.71	-35.236
NIPER290	ZINC00971085	-8.051	-47.145	-22.669	-1.886	-20.783	-70.92	-36.493
NIPER291	ZINC00641227	-8.015	-50.993	-21.155	-0.816	-20.338	-79.37	-37.025
NIPER292	ZINC00847278	-7.991	-44.336	-21.329	-2.315	-19.014	-67.63	-34.763
NIPER293	ZINC00641225	-7.984	-51.272	-22.565	-1.633	-20.932	-76.44	-36.97
NIPER294	ZINC00641211	-7.966	-48.057	-17.479	1.363	-18.842	-71.71	-31.821
NIPER295	ZINC13551169	-7.962	-44.684	-23.17	-2.637	-20.533	-84.32	-36.969
NIPER296	ZINC00182977	-7.957	-43.471	-21.193	-2.464	-18.729	-65.26	-33.972
NIPER297	ZINC00725460	-7.929	-47.279	-26.002	-5.029	-20.972	-70.45	-39.076
NIPER298	ZINC00641153	-7.889	-49.984	-17.256	1.434	-18.69	-71.3	-31.758
NIPER299	ZINC00862555	-7.848	-48.535	-23.95	-4.239	-19.711	-69.4	-36.482
NIPER300	ZINC01016443	-7.848	-49.901	-18.361	0.778	-19.139	-74.84	-33
NIPER301	ZINC00725466	-7.841	-45.453	-23.098	-3.464	-19.634	-65.92	-35.494
NIPER302	ZINC04371961	-7.829	-58.47	-30.1	-6.276	-23.824	-84.45	-46.38
NIPER303	ZINC00641209	-7.805	-49.893	-17.624	1.239	-18.863	-73.25	-31.867
NIPER304	ZINC00641219	-7.786	-51.118	-18.585	0.609	-19.194	-75.18	-33.027
NIPER305	ZINC00641164	-7.775	-49.669	-17.301	1.475	-18.776	-75.67	-32.635
NIPER306	ZINC00862810	-7.725	-43.43	-14.441	5.093	-19.534	-68.49	-28.108
NIPER307	ZINC19597204	-7.721	-43.126	-30.605	-9.745	-20.861	-55.28	-37.82
NIPER308	ZINC00706519	-7.693	-45.64	-13.537	2.176	-15.713	-63.58	-25.248
NIPER309	ZINC00634911	-7.679	-45.059	-15.173	1.702	-16.875	-56.88	-26.32
NIPER310	ZINC00985688	-7.677	-45.295	-23.672	-2.413	-21.258	-80.98	-38.569
NIPER311	ZINC05785575	-7.669	-49.38	-21.506	-1.239	-20.267	-78.16	-35.94
NIPER312	ZINC00706470	-7.661	-49.211	-20.341	0.941	-21.282	-66.78	-33.905
NIPER313	ZINC02187844	-7.653	-46.304	-19.865	0.188	-20.054	-79.95	-32.793
NIPER314	ZINC02085622	-7.643	-48.803	-26.075	-4.531	-21.544	-77.7	-38.753
NIPER315	ZINC00725553	-7.619	-42.304	-16.03	0.463	-16.493	-62.61	-27.353
NIPER316	ZINC08455412	-7.611	-57.479	-30.849	-3.845	-27.005	-80.12	-45.052
NIPER317	ZINC02085787	-7.585	-45.757	-24.433	0.013	-24.447	-76.95	-35.547
NIPER318	ZINC02747018	-7.58	-48.701	-22.848	-2.214	-20.633	-83.22	-37.78
NIPER319	ZINC00845573	-7.527	-47.928	-16.501	4.634	-21.135	-71.6	-30.729
NIPER320	ZINC04066384	-7.51	-42.968	-12.968	3.326	-16.294	-69.76	-25.017
NIPER321	ZINC02104352	-7.504	-50.536	-23.855	-3.691	-20.164	-81.71	-37.605
NIPER322	ZINC02742156	-7.501	-46.359	-19.387	2.921	-22.307	-69.57	-29.062
NIPER323	ZINC13555009	-7.489	-61.518	-29.008	-2.514	-26.493	-70.44	-39.698
NIPER324	ZINC00993349	-7.446	-56.929	-27.775	-4.489	-23.286	-80.1	-40.871
NIPER325	ZINC13144609	-7.434	-41.08	-7.151	10.543	-17.694	-23.04	-7.882
NIPER326	ZINC00071321	-7.431	-39.145	-16.405	0.02	-16.425	-62.24	-25.358
NIPER327	ZINC00845585	-7.415	-42.715	-13.702	5.451	-19.153	-66.07	-27.084
NIPER328	ZINC01009870	-7.406	-42.462	-20.285	0.135	-20.42	-85.29	-34.828
NIPER329	ZINC00708949	-7.397	-44.968	-15.224	4.548	-19.772	-70.87	-29.265
NIPER330	ZINC13424220	-7.393	-41.735	-25.601	-7.53	-18.071	-65.92	-36.106
NIPER331	ZINC00706477	-7.384	-36.789	-21.371	-3.067	-18.304	-74.45	-33.276
NIPER332	ZINC04066632	-7.377	-45.411	-16.794	1.149	-17.943	-71.47	-27.83
NIPER333	ZINC02771690	-7.368	-44.94	-22.266	-2.248	-20.018	-69.83	-34.01
NIPER334	ZINC04030866	-7.334	-45.9	-17.63	-0.385	-17.245	-75.18	-30.278
NIPER335	ZINC01926532	-7.287	-38.64	-20.934	-4.308	-16.626	-48.68	-28.573
NIPER336	ZINC08834685	-7.284	-57.278	-16.456	4.53	-20.986	-95.53	-35.048
NIPER337	ZINC12726073	-7.281	-41.77	-24.671	-5.102	-19.569	-66.16	-37.231
NIPER338	ZINC02920577	-7.258	-41.841	-19.215	-1.338	-17.877	-70.41	-30.783
NIPER339	ZINC08384321	-7.255	-51.625	-29.217	-3.28	-25.937	-78.61	-42.257
NIPER340	ZINC02695916	-7.248	-42.694	-21.314	-0.854	-20.46	-70.61	-33.328
NIPER341	ZINC04476085	-7.242	-40.81	-7.685	8.06	-15.745	-60.22	-19.168
NIPER342	ZINC04619065	-7.23	-41.214	-20.032	2.954	-22.986	-61.76	-28.275
NIPER343	ZINC00845657	-7.22	-41.949	-13.192	5.526	-18.718	-62.52	-25.974
NIPER344	ZINC00974500	-7.216	-42.189	-23.164	-3.823	-19.341	-72.99	-36.251

NIPER345	ZINC00298364	-7.211	-43.458	-19.083	-0.535	-18.548	-61.85	-30.236
NIPER346	ZINC04364878	-7.204	-61.661	-21.783	1.027	-22.81	-67.21	-35.684
NIPER347	ZINC02187934	-7.193	-40.724	-18.843	1.719	-20.562	-72.98	-29.923
NIPER348	ZINC00684207	-7.188	-47.813	-22.41	-2.912	-19.499	-78.22	-35.855
NIPER349	ZINC02186823	-7.165	-38.146	-23.293	-4.066	-19.227	-75.68	-33.984
NIPER350	ZINC02095801	-7.127	-42.455	-17.356	2.721	-20.078	-72.4	-29.403
NIPER351	ZINC06757348	-7.099	-35.068	-20.912	-1.701	-19.21	-70.33	-29.908
NIPER352	ZINC19801929	-7.093	-35.972	-32.635	-10.733	-21.902	-59.24	-40.273
NIPER353	ZINC04369149	-7.068	-60.264	-21.846	0.871	-22.717	-77.63	-38.136
NIPER354	ZINC00716301	-7.066	-44.811	-21.078	-2.165	-18.912	-65.08	-32.945
NIPER355	ZINC04064575	-7.065	-41.02	-27.134	-5.996	-21.138	-66.78	-38.739
NIPER356	ZINC05769485	-7.041	-37.444	-24.408	-8.154	-16.254	-45.48	-31.906
NIPER357	ZINC02745365	-7.033	-41.382	-21.904	0.056	-21.96	-77.33	-33.604
NIPER358	ZINC02914960	-6.993	-42.824	-18.693	0.15	-18.843	-74.95	-31.031
NIPER359	ZINC04631885	-6.983	-36.974	-19.337	-2.777	-16.56	-60.47	-31.462
NIPER360	ZINC04066269	-6.973	-46.055	-20.016	-1.863	-18.153	-68.92	-29.928
NIPER361	ZINC01212264	-6.971	-45.315	-17.21	4.318	-21.528	-85.15	-34.16
NIPER362	ZINC13123003	-6.957	-40.213	-18.973	-4.653	-14.32	-58.15	-29.674
NIPER363	ZINC00639154	-6.939	-52.576	-32.202	-6.19	-26.012	-76.11	-44.208
NIPER364	ZINC00712983	-6.938	-45.3	-28.535	-9.34	-19.195	-68.57	-44.627
NIPER365	ZINC17111482	-6.933	-34.594	-13.287	0.57	-13.857	-56.44	-24.164
NIPER366	ZINC05825739	-6.928	-46.235	-19.649	-1.158	-18.491	-73.61	-34.034
NIPER367	ZINC00664731	-6.926	-58.14	-22.556	0.761	-23.318	-66.82	-35.78
NIPER368	ZINC02478992	-6.911	-30.457	-18.458	-6.018	-12.44	-47.43	-24.681
NIPER369	ZINC08455009	-6.897	-58.073	-35.468	-7.373	-28.094	-85.81	-49.372
NIPER370	ZINC06386085	-6.896	-45.655	-20.986	-2.06	-18.926	-74.97	-35.774
NIPER371	ZINC00644398	-6.891	-61.599	-29.025	0.565	-29.59	-86.79	-43.332
NIPER372	ZINC00816767	-6.88	-44.474	-14.6	3.522	-18.122	-67.68	-25.775
NIPER373	ZINC02912026	-6.872	-40.48	-18.243	-0.111	-18.132	-71.53	-29.686
NIPER374	ZINC04019931	-6.869	-47.257	-22.884	-4.076	-18.808	-71.35	-34.41
NIPER375	ZINC06570965	-6.853	-39.541	-19.353	-2.885	-16.467	-68.71	-28.6
NIPER376	ZINC08449631	-6.833	-55.602	-34.36	-11.537	-22.823	-64.57	-38.657
NIPER377	ZINC04473112	-6.819	-46.533	-20.931	1.81	-22.741	-57.1	-28.751
NIPER378	ZINC09088346	-6.817	-45.773	-29.485	-11.193	-18.291	-79.98	-42.672
NIPER379	ZINC00632469	-6.802	-45.871	-25.764	-4.893	-20.871	-82.75	-41.195
NIPER380	ZINC00654256	-6.791	-48.136	-24.146	1.445	-25.591	-73.01	-36.664
ANTIVIRALS								
NIPER381	Ref-lig-6Y2G complex	-8.547	-78.794	-29.157	1.884	-31.042	-109.77	-48.254
NIPER382	Ritonavir	-8.246	-82.859	-35.632	-0.968	-34.664	-100.95	-52.473
NIPER383	Remdesvir	-5.799	-54.926	-27.258	0.936	-28.194	-76.6	-38.846
NIPER384	Azithromycin	-5.621	-12.302	-9.888	8.156	-18.044	-78.91	-24.028
NIPER385	Hydroxychloroquine	-5.083	-34.454	-20.539	-2.672	-17.867	-75.07	-32.388
NIPER386	Favipiravir	-4.732	-22.537	-11.816	-5.099	-6.717	-29.05	-18.683
NIPER387	Lopinovir	-4.226	-58.089	-24.963	4.932	-29.895	-86.11	-39.044

Table S4. QikProp results of ADME parameters of top ranked molecules screened from different databases

Sr. No.	Chemical ID	S	M.W	QLogPo/w	QLogS	QPPCaco	QLogBB	PHOA	ROF
NIPER1	ZINC67910471	7	662.643	1.698	-5.487	7.781	-4.395	13.958	3
NIPER2	ZINC67910479	7	662.643	1.546	-5.07	7.22	-4.279	12.489	3
NIPER4	ZINC67912589	7	607.61	-1.492	-2.05	4.833	-3.898	0	3
NIPER5	ZINC67903197	8	594.525	-2.027	-2.637	1.443	-4.466	0	3
NIPER6	ZINC67910753	11	686.663	-2.055	-2.006	3.036	-4.662	0	3
NIPER77	DB01661	10	719.279	-3.203	0.159	0	-6.977	0	3

NIPER78	DB13764	10	654.577	-2.35	-2.912	0.44	-5.801	0	3
NIPER79	DB04023	11	619.329	-4.386	-0.856	0	-6.199	0	3
NIPER80	DB03041	7	580.289	-4.069	-0.636	0.001	-5.95	0	3
NIPER81	DB04158	15	764.328	-4.727	-1.976	0	-10.547	0	3
NIPER82	DB01792	9	653.392	-3.643	-1.821	0.001	-6.404	0	3
NIPER178	Z1899461190	0	446.468	4.027	-5.633	1723.086	0.053	100	0
NIPER179	Z1344189646	0	370.447	2.658	-4.579	548.996	-0.963	91.541	0
NIPER180	Z1951768720	0	305.308	1.216	-2.166	271.061	-0.567	77.613	0
NIPER181	Z1443065604	1	393.417	4.808	-6.888	1505.927	-0.35	100	0
NIPER182	Z2194546487	0	337.377	1.193	-2.777	45.22	-1.593	63.559	0
NIPER183	Z1748052226	0	290.749	2.652	-4.225	1226.082	-0.295	100	0
NIPER280	ZINC00641197	0	441.483	4.899	-6.284	905.915	-0.957	100	0
NIPER281	ZINC00706449	0	396.442	5.215	-6.379	726.214	-0.985	95.73	1
NIPER282	ZINC00679320	0	424.455	2.517	-4.036	27.569	-2.201	67.466	0
NIPER283	ZINC00641249	1	369.85	5.121	-6.854	823.852	-0.48	96.159	1
NIPER284	ZINC08384151	0	440.9	3.711	-5.891	457.052	-1.013	96.281	0
NIPER285	ZINC36044798	1	411.434	3.149	-5.366	289.72	-1.301	89.449	0
NIPER381	Ref-Lig-6Y2G complex	2	593.678	3.123	-5.246	27.253	-2.893	45.006	2
NIPER382	Ritonavir	9	720.943	6.828	-8.364	385.644	-1.859	74.338	3
NIPER383	Remdesvir	4	602.583	1.344	-4.737	37.111	-3.117	36.991	2
NIPER384	Azithromycin	6	748.993	3.812	-1.491	45.159	-0.428	52.965	2
NIPER385	Hydroxychlorquine	0	335.876	3.173	-2.903	442.502	-0.207	92.882	0
NIPER386	Favipiravir	1	157.104	-0.402	-1.247	109.87	-0.968	61.119	0
NIPER387	Lopinovir	3	628.81	5.691	-6.255	781.339	-1.404	86.124	2

QikProp parameters for ADME: S (STARS) = Number of property/descriptor values falling outside the 95% range of similar values for known drugs (Recommended value 0-5) ; MW = Molecular weight; QPlogPo/w = Predicted octanol / water partition coefficient(Recommended values -2.0 – 6.5); QPlogS = Predicted aqueous solubility, log S(Recommended values -6.5 – 0.5); QPPCaco = Predicted apparent Caco-2 cell permeability in nm/sec(Recommended values <25 poor, >500 great); QPlogBB = Predicted brain/blood partition coefficient(Recommended values -3.0 – 1.2); PHOA= Predicted human oral absorption on 0 to 100%

Figures

Figure 1

Stereo view of the protein-ligand interactions for a screened molecule (blue). Reference ligand in 6Y2G is shown in wire frame model (green). Hydrogen bonds and hydrophobic interactions are shown in yellow and green dotted lines.

Figure 2

Stereo view of docked poses of representative molecules from databases. The reference ligand in 6Y2G is shown in green. The protein is not displayed for clarity.

Figure 3

Water maps for 5Å cavity of (A) 5R82 and (B) 6Y2G. Unstable waters are shown in red balls and reference ligands are shown in ball and stick

Figure 4

Stereo view showing the superposition of crystal waters and replaceable waters in (A) 5R82 (Top) and (B) 6Y2G (bottom). Crystal waters are shown in stick and reference ligands are shown in ball and stick model.

ZINC67910471

ZINC67910479

DB01661

DB13764

Z1899461190

Z1344189646

ZINC00641197

ZINC0070449

Figure 5

2D Structure of top ranked docked molecules from different database

Supplementary Files

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