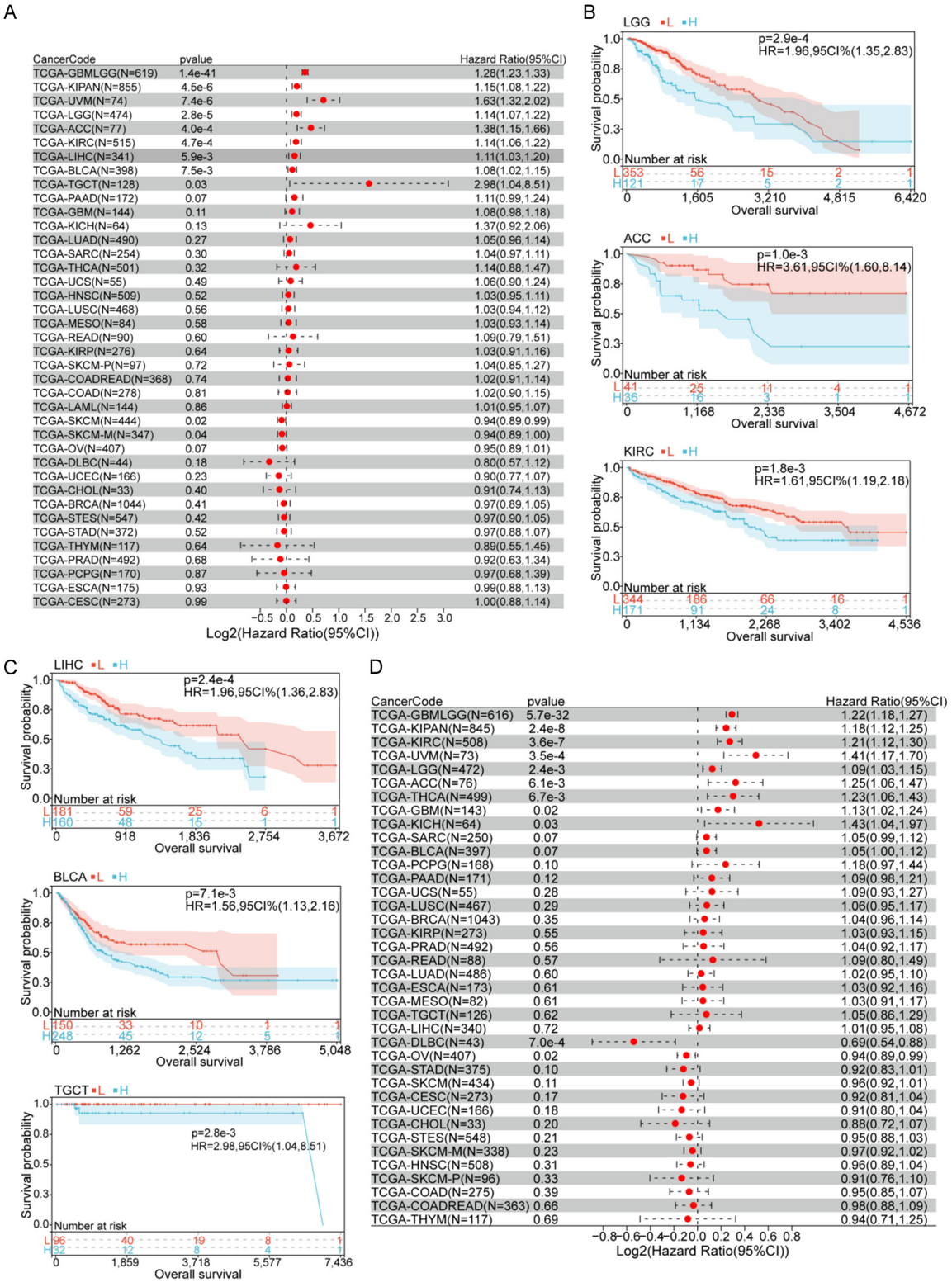
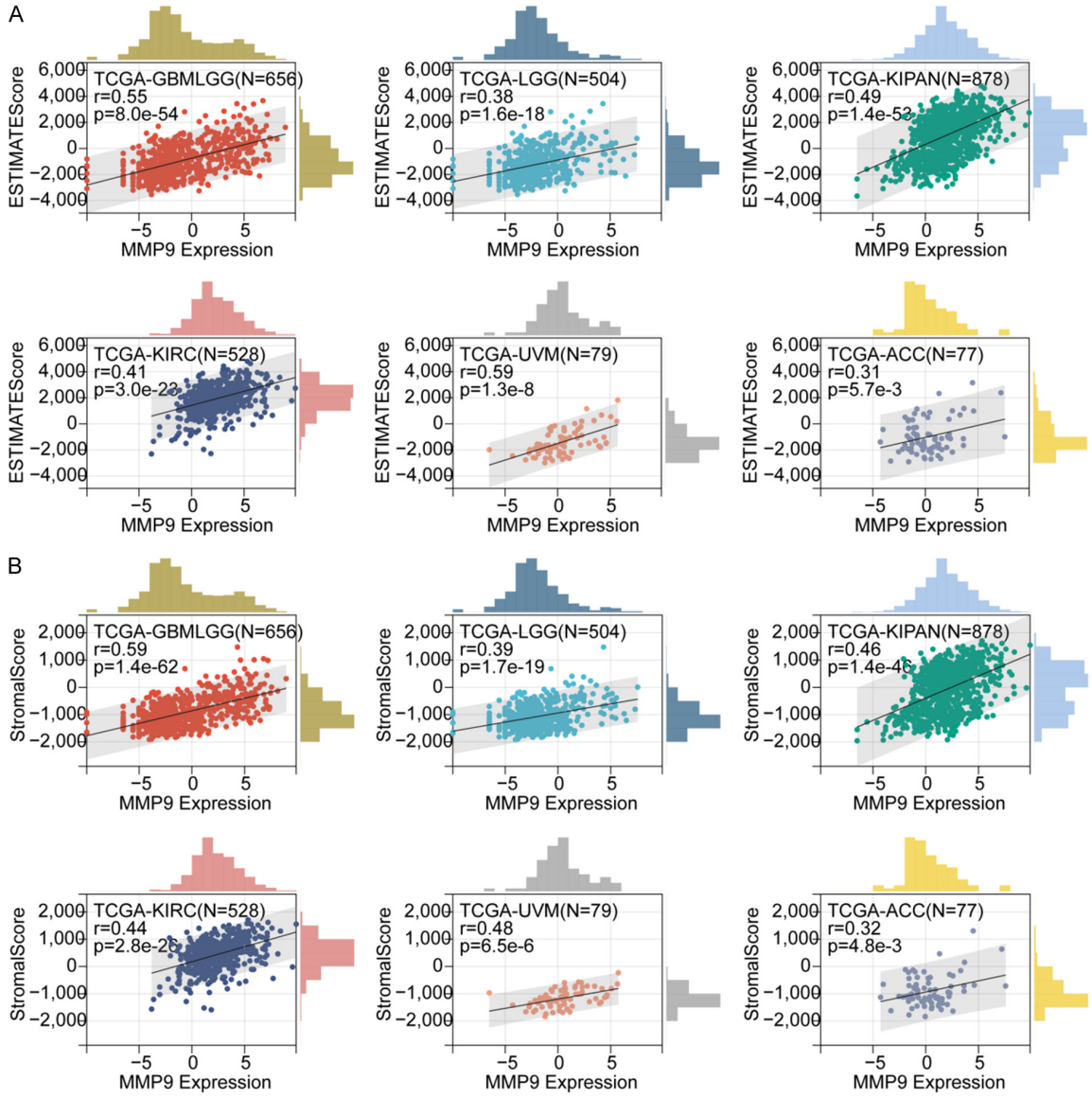
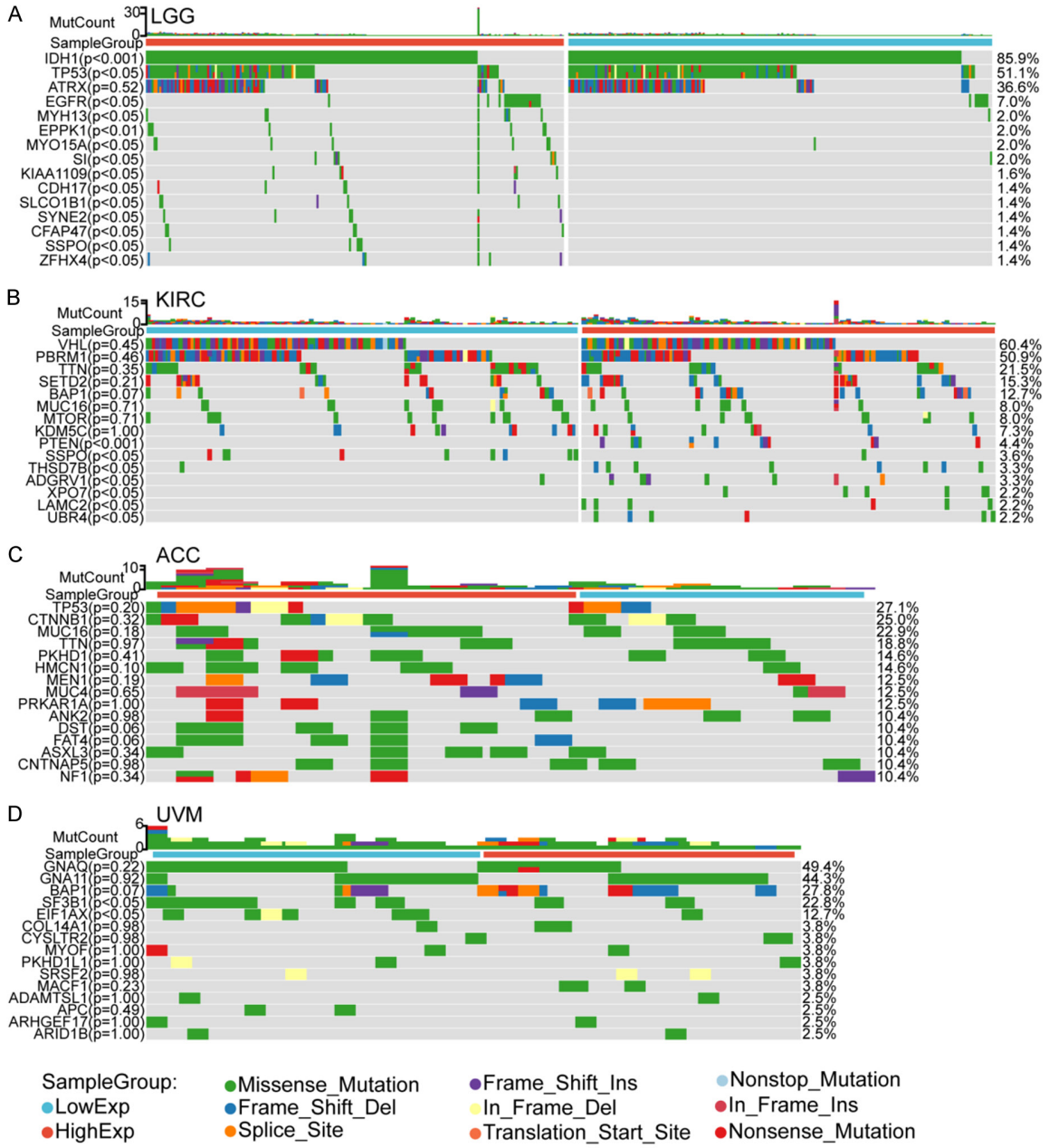


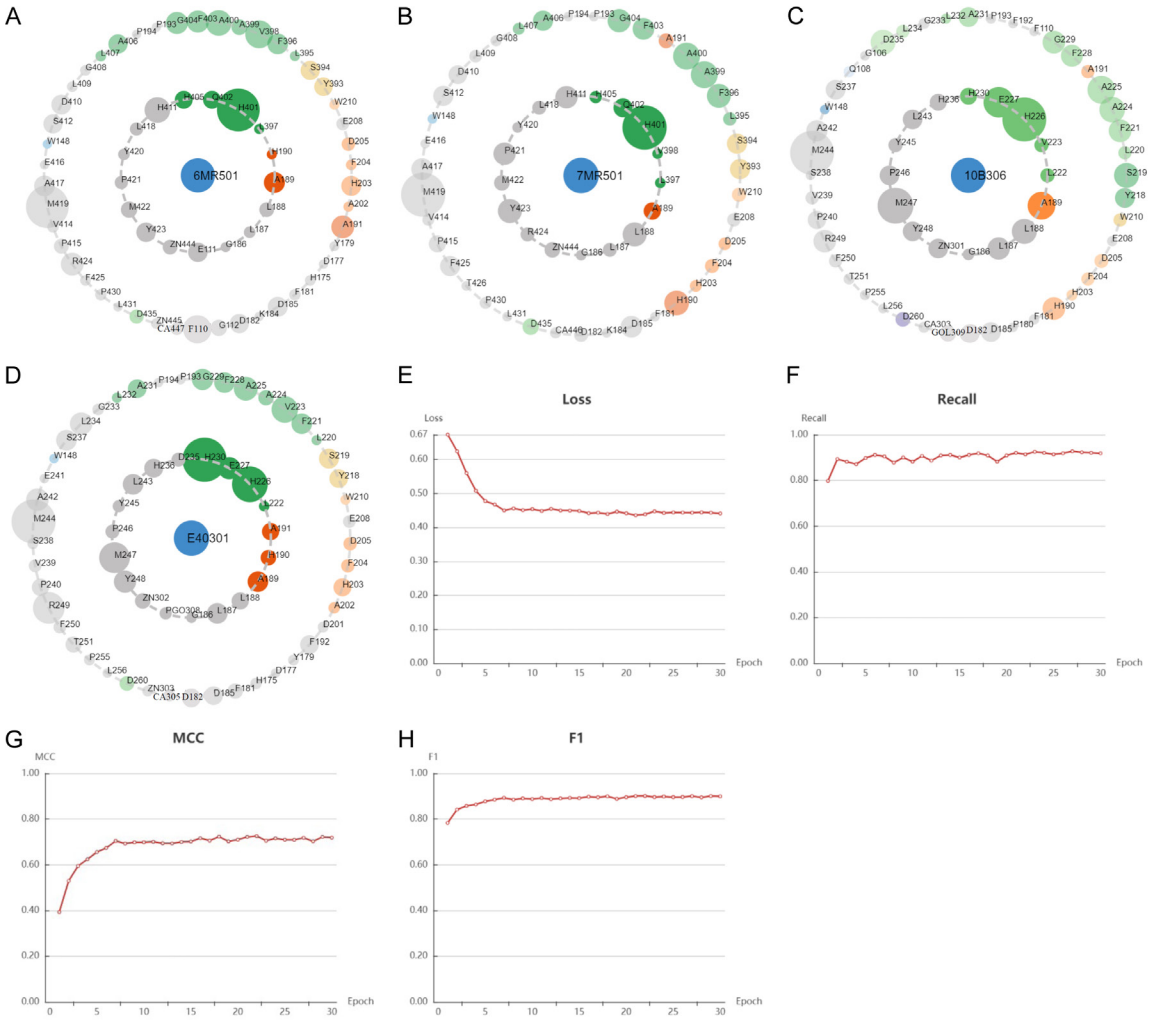
Supplementary Figure 1. (A) MMP9 expression correlates with overall survival time (OS). Forest plots showing the correlations between OS and MMP9 expression across 39 types of cancers. (B, C) Survival curves of MMP9 expression in LGG, ACC, KRIC, LIHC, BLCA and TGCT. L represents low expression of MMP9 group, H represents high expression of MMP9 group. (D) Forest plots showing the correlations between Progression-free survival time (PFS) and MMP9 expression across 39 types of cancers.



Supplementary Figure 2. Pan-cancer cohort (GBMLGG, KICH, KIRC, KIRP, KIPAN and UVM). Correlation between MMP9 expression and pan-cancer (A) estimate score and (B) stroma score.



Supplementary Figure 3. Correlation between MMP9 expression and tumor mutation burden in (A) LGG, (B) KIRC, (C) ACC and (D) UVM.



Supplementary Figure 4. The interaction between MMP9 and MMP9's inhibitors (A) 20W0 (B) 20W1 (C) 4H3X and (D) 4WZV. (E-H) Evaluation index of deep learning model. Loss, Recall, MCC and F1.

Supplementary Table 1. Adsorption, distribution, metabolism, and excretion properties of compounds

	Solubility Level	BBB level	CYP2D6	Hepatotoxicity	Absorption Level	PPB Level
CHEMBL344828 PubChem-10764489	3	3	0	1	0	0
CHEMBL2425940 PubChem-73293197	3	4	0	1	3	1
CHEMBL139884 PubChem-10502046	3	3	0	1	0	1
CHEMBL381554 PubChem-44409390	3	4	0	1	0	1
CHEMBL2425944 PubChem-73293200	4	4	0	1	3	0
CHEMBL82047 PubChem-10738924	3	3	0	0	0	1
CHEMBL196647 PubChem-44402021	4	4	0	1	3	1
CHEMBL381163 PubChem-44409365	3	4	0	0	1	1
CHEMBL206481 PubChem-44409389	3	4	0	1	2	0
CHEMBL207776 PubChem-21304710	3	3	0	1	0	1
CHEMBL138643 PubChem-23523890	2	4	0	1	3	1
CHEMBL382227 PubChem-44411830	2	4	0	1	1	1
CHEMBL419503 PubChem-44325156	4	4	0	1	3	0
CHEMBL252711 PubChem-44445823	4	4	0	1	3	0
CHEMBL433171 PubChem-21130561	2	4	0	0	0	1

CHEMBL1801052 PubChem-9847113	2	4	0	1	1	1
CHEMBL234529 PubChem-25181080	3	4	0	0	3	1
CHEMBL126004 PubChem-10389610	3	4	0	1	0	1
CHEMBL236167 PubChem-23655323	3	3	0	1	0	1
CHEMBL429800 PubChem-23656291	3	3	0	1	0	1
CHEMBL358812 PubChem-10549612	4	4	0	1	2	0
CHEMBL1801395 PubChem-22707860	2	4	0	1	1	1
CHEMBL1916211 PubChem-57403331	2	2	0	1	0	1
CHEMBL1770697 PubChem-20620715	2	4	0	1	2	1
CHEMBL47728 PubChem-44291532	3	3	0	1	0	1
CHEMBL303082 PubChem-44306344	2	4	0	1	3	1
CHEMBL71227 PubChem-44309863	2	4	0	1	1	1
CHEMBL1770712 PubChem-20620688	3	4	0	1	0	1
CHEMBL164980 PubChem-11070343	3	4	0	1	1	0
CHEMBL44045 PubChem-44289352	3	3	0	0	0	1
CHEMBL362797 PubChem-22644895	3	3	0	1	0	1
CHEMBL561625 PubChem-45269631	3	3	0	1	0	1
CHEMBL35606	3	4	0	1	0	1
CHEMBL2425935 PubChem-73292710	3	4	0	1	1	0
CHEMBL2204827 PubChem-71459505	3	3	0	1	0	1
CHEMBL369302 PubChem-22644965	3	4	0	1	0	1
CHEMBL1771223 PubChem-54587429	2	4	0	1	3	1
CHEMBL92778 PubChem-9913479	2	4	0	1	1	1
CHEMBL292671 PubChem-44299758	3	4	0	1	3	1
CHEMBL1771216 PubChem-20620240	3	4	0	0	3	1
CHEMBL1801431 PubChem-10280852 PubChem-46939559	2	4	0	1	2	1
CHEMBL381505 PubChem-44409164	3	4	0	1	2	1
CHEMBL1771222 PubChem-54580544	2	4	0	1	2	1
CHEMBL1771215 PubChem-10483139	2	4	0	1	3	1
CHEMBL1771221 PubChem-54583511	2	4	0	1	2	1
CHEMBL42771 PubChem-44289604	3	3	0	1	0	1
CHEMBL1801398 PubChem-46938727	2	4	0	1	0	1
CHEMBL44250 PubChem-10572544	3	3	0	0	0	1
CHEMBL338007 PubChem-10789711	4	4	0	1	1	0

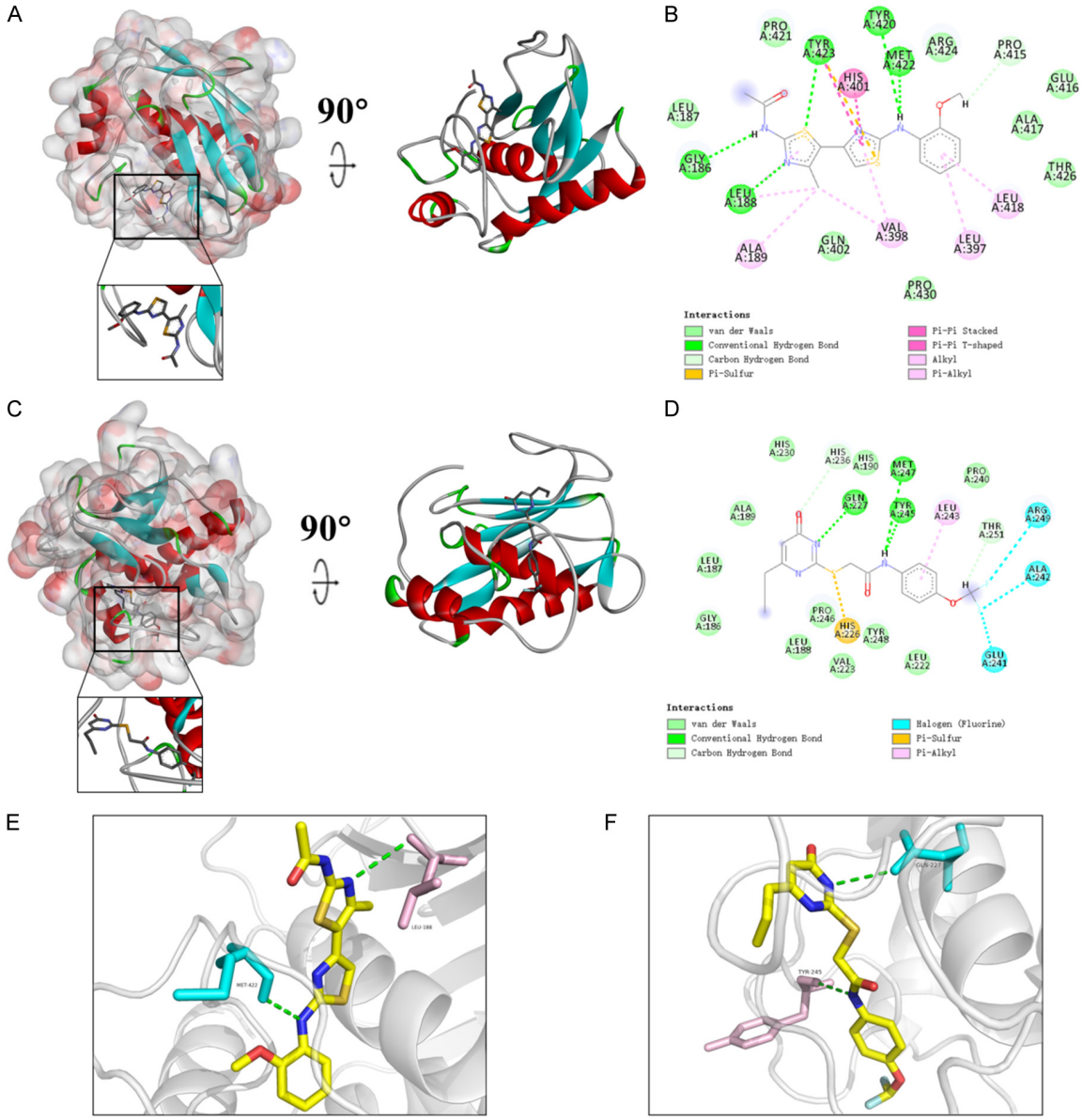
Aqueous-solubility level: 0 (extremely low); 1 (very low, but possible); 2 (low); 3 (good). Blood brain barrier level: 0 (Very high penetrant); 1 (High); 2 (Medium); 3 (Low); 4 (Undefined). Cytochrome P450 2D6 level: 0 (Non-inhibitor); 1 (Inhibitor). Hepatotoxicity: 0 (Nontoxic); 1 (Toxic). Human-intestinal absorption level: 0 (good); 1 (moderate); 2 (poor); 3 (very poor). Plasma protein binding: 0 (Absorbent weak); 1 (Absorbent strong).

Supplementary Table 2. Toxicities of compounds

	Mouse NTP		Rat NTP		AMES	DTP
	Female	Male	Female	Male		
CHEMBL344828 PubChem-10764489	0	0.68	0.809	0.383	1	0.978
CHEMBL2425940 PubChem-73293197	0	0	1	1	1	0
CHEMBL139884 PubChem-10502046	0	0.016	0	0.701	0.396	0.999
CHEMBL381554 PubChem-44409390	0	0	0	0	0.844	1
CHEMBL2425944 PubChem-73293200	0	0.109	1	1	1	0.001
CHEMBL82047 PubChem-10738924	0	0.964	0.439	1	0.99	0.11
CHEMBL196647 PubChem-44402021	0.59	0	1	1	1	1
CHEMBL381163 PubChem-44409365	0	0	0.062	0.023	0.964	1
CHEMBL206481 PubChem-44409389	0	0	0	0	0.623	1
CHEMBL207776 PubChem-21304710	0	0.003	0	0.898	0.498	0.946

CHEMBL138643 PubChem-23523890	0	1	1	1	1	1
CHEMBL382227 PubChem-44411830	0.032	0.05	1	1	0	1
CHEMBL419503 PubChem-44325156	0	0.004	1	1	0.995	1
CHEMBL252711 PubChem-44445823	0	0	1	1	1	1
CHEMBL433171 PubChem-21130561	0.898	0.005	0.953	1	1	1
CHEMBL1801052 PubChem-9847113	0.076	0.352	1	1	0.424	1
CHEMBL234529 PubChem-25181080	0.985	0.028	1	0	1	0.946
CHEMBL126004 PubChem-10389610	0	0.891	1	1	0.137	0.002
CHEMBL236167 PubChem-23655323	0.003	0.012	1	1	1	0.434
CHEMBL429800 PubChem-23656291	0.003	0.012	1	1	1	0.434
CHEMBL358812 PubChem-10549612	0	0.006	1	1	0.639	0.003
CHEMBL1801395 PubChem-22707860	0	0.002	0.999	1	0.948	1
CHEMBL1916211 PubChem-57403331	0	0	0	1	1	0.98
CHEMBL1770697 PubChem-20620715	0.006	0.821	1	1	0	1
CHEMBL47728 PubChem-44291532	0	0	0	0	0.777	0
CHEMBL303082 PubChem-44306344	1	0.636	1	1	0.999	0.521
CHEMBL71227 PubChem-44309863	0	0.001	0.993	1	0.983	1
CHEMBL1770712 PubChem-20620688	0.018	0.998	1	1	0.92	1
CHEMBL164980 PubChem-11070343	0	1	0	1	1	0.273
CHEMBL44045 PubChem-44289352	0	0.752	0.999	0.999	0	1
CHEMBL362797 PubChem-22644895	0	0.001	0	0	0.071	0.649
CHEMBL561625 PubChem-45269631	0	0.009	0.001	0.984	1	0
CHEMBL35606	0	0.002	0	1	0.968	0
CHEMBL2425935 PubChem-73292710						
CHEMBL2204827 PubChem-71459505	0.025	0.364	0.998	1	1	0.829
CHEMBL369302 PubChem-22644965	1	0.63	1	1	1	0.002
CHEMBL1771223 PubChem-54587429	0	0.227	1	1	0.374	0
CHEMBL92778 PubChem-9913479	1	0.005	1	1	1	1
CHEMBL292671 PubChem-44299758	0.987	1	0.903	1	1	0.002
CHEMBL1771216 PubChem-20620240	0	0.997	1	1	0.689	0
CHEMBL1801431 PubChem-10280852 PubChem-46939559	0	0.001	0.992	1	0.588	1
CHEMBL381505 PubChem-44409164	0	0.17	0	0.712	0.024	0.998
CHEMBL1771222 PubChem-54580544	0	0.776	1	1	1	0.813
CHEMBL1771215 PubChem-10483139	0	0.24	1	1	0.334	0
CHEMBL1771221 PubChem-54583511	0	0.187	1	1	1	0.996
CHEMBL42771 PubChem-44289604	0	0.875	1	0.899	0.001	1
CHEMBL1801398 PubChem-46938727	0	0.024	0.966	1	0	1
CHEMBL44250 PubChem-10572544	0.001	0.611	1	1	0.002	1
CHEMBL338007 PubChem-10789711	0	0.998	1	1	1	1

NTP < 0.3 (Non-Carcinogen); > 0.7 (Carcinogen). AMES < 0.3 (Non-Mutagen); > 0.7 (Mutagen). DTP < 0.3 (Nontoxic); > 0.7 (Toxic).



Supplementary Figure 5. Schematic drawing of interactions between control drugs and MMP9. (A) JNJ0966-MMP9 complex, (B) JNJ0966 with MMP9, (C) MMP-9-IN-1-MMP9 complex, (D) MMP-9-IN-1 with MMP9. Schematic of intermolecular interaction of the predicted binding modes of (E) JNJ0966 with MMP9, and (F) MMP-9-IN-1 with MMP9.