

Supplementary Information

Identifying Potential Machine Learning Algorithms for the Simulation of Binding Affinities to Molecularly Imprinted Polymers

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Supplementary Table S1. MIP training data set

| Molecule | SMILE | C _i / mM | C _f / mM | S _b / μmol g ⁻¹ |
|--------------------|---|---------------------|---------------------|---------------------------------------|
| 2-methoxyphenidine | COc1ccccc1C(Cc2ccccc2)N3CCCCC3 0.1 | 0.1 | 5.89 | 24.25494 |
| caffeine | CN1C=NC2=C1C(=O)N(C(=O)N2C)C 0.1 | 0.1 | 102.63 | -0.65789 |
| paracetamol | CC(=O)NC1=CC=C(C=C1)O 0.1 | 0.1 | 67.83 | 8.04315 |
| sucrose | OCC2OC(OC1(CO)OC(CO)C(O)C1O)C(O)C(O)C2O 0.1 | 0.1 | 51.58 | 12.10526 |
| aspirin | CC(=O)Oc1ccccc1C(=O)O 0.1 | 0.1 | 52.63 | 11.84211 |
| crystal violet | CN(C)c3ccc(C(c1ccc(N(C)C)cc1)=c2ccc(=[N+](C)C)cc2)cc3 | 0.1 | 0 | 2.5 |
| basic blue | CCNc3ccc(C(c1ccc(N(CC)CC)cc1)=c2ccc(=[N+](CC)CC)cc2)c4ccccc34 | 0.1 | 0 | 2.5 |
| methyl orange | CN(C)c2ccc(/N=N/c1ccc(S(=O)(=O)[O-])cc1)cc2 | 0.1 | 8.99 | 0.02533 |
| phenol red | O=S(=O)([O-])c3ccc(C(c1ccc(O)cc1)=c2ccc(=[OH+])cc2)cc3 | 0.1 | 7.87E-01 | 0.05315 |
| 4-methoxyphenidine | COc3ccc(C(Cc1ccccc1)N2CCCCC2)cc3 0.1 | 0.1 | 70.88 | 7.28047 |
| ephedrine | CCNC(Cc1ccccc1)c2ccccc2 | 0.1 | 385.83 | 28.542 |
| 2-methoxyephedrine | CCNC(Cc1ccccc1)c2ccccc2OC | 0.1 | 370.65 | 32.3367 |
| 4-methoxyephedrine | CCNC(Cc1ccccc1)c2ccc(OC)cc2 | 0.1 | 220.36 | 69.9111 |
| 2-methoxyphenidine | COc1ccccc1C(Cc2ccccc2)N3CCCCC3 0.1 | 0.2 | 0.0107 | 46.85651 |
| caffeine | CN1C=NC2=C1C(=O)N(C(=O)N2C)C 0.1 | 0.2 | 0.18684 | 3.2569 |
| paracetamol | CC(=O)NC1=CC=C(C=C1)O 0.1 | 0.2 | 0.15915 | 10.11039 |
| sucrose | OCC2OC(OC1(CO)OC(CO)C(O)C1O)C(O)C(O)C2O 0.1 | 0.2 | 0.11579 | 20.84419 |
| aspirin | CC(=O)Oc1ccccc1C(=O)O 0.1 | 0.2 | 0.09474 | 26.05524 |
| crystal violet | CN(C)c3ccc(C(c1ccc(N(C)C)cc1)=c2ccc(=[N+](C)C)cc2)cc3 | 0.2 | 1.09E-04 | 0.47279 |
| basic blue | CCNc3ccc(C(c1ccc(N(CC)CC)cc1)=c2ccc(=[N+](CC)CC)cc2)c4ccccc34 | 0.2 | 0 | 5 |
| methyl orange | CN(C)c2ccc(/N=N/c1ccc(S(=O)(=O)[O-])cc1)cc2 | 0.2 | 0.0018 | 0.04935 |
| phenol red | O=S(=O)([O-])c3ccc(C(c1ccc(O)cc1)=c2ccc(=[OH+])cc2)cc3 | 0.2 | 0.00169 | 0.07677 |
| 4-methoxyphenidine | COc3ccc(C(Cc1ccccc1)N2CCCCC2)cc3 0.1 | 0.2 | 0.15945 | 10.13785 |
| ephedrine | CCNC(Cc1ccccc1)c2ccccc2 | 0.2 | 0.17309 | 6.7266 |
| 2-methoxyephedrine | CCNC(Cc1ccccc1)c2ccccc2OC | 0.2 | 0.12073 | 19.81764 |
| 4-methoxyephedrine | CCNC(Cc1ccccc1)c2ccc(OC)cc2 | 0.2 | 0.0712 | 32.2 |
| 2-methoxyphenidine | COc1ccccc1C(Cc2ccccc2)N3CCCCC3 | 0.3 | 0.01815 | 69.42034 |
| caffeine | CN1C=NC2=C1C(=O)N(C(=O)N2C)C | 0.3 | 0.27368 | 6.48172 |
| paracetamol | CC(=O)NC1=CC=C(C=C1)O | 0.3 | 0.25262 | 11.6707 |
| sucrose | OCC2OC(OC1(CO)OC(CO)C(O)C1O)C(O)C(O)C2O | 0.3 | 0.15263 | 36.29764 |
| aspirin | CC(=O)Oc1ccccc1C(=O)O | 0.3 | 0.16684 | 32.79751 |
| crystal violet | CN(C)c3ccc(C(c1ccc(N(C)C)cc1)=c2ccc(=[N+](C)C)cc2)cc3 | 0.3 | 1.14E-04 | 0.72138 |
| basic blue | CCNc3ccc(C(c1ccc(N(CC)CC)cc1)=c2ccc(=[N+](CC)CC)cc2)c4ccccc34 | 0.3 | 0 | 7.5 |
| methyl orange | CN(C)c2ccc(/N=N/c1ccc(S(=O)(=O)[O-])cc1)cc2 | 0.3 | 0.0026 | 0.0995 |
| phenol red | O=S(=O)([O-])c3ccc(C(c1ccc(O)cc1)=c2ccc(=[OH+])cc2)cc3 | 0.3 | 0.00274 | 0.06524 |
| 4-methoxyphenidine | COc3ccc(C(Cc1ccccc1)N2CCCCC2)cc3 | 0.3 | 0.17443 | 31.39314 |
| ephedrine | CCNC(Cc1ccccc1)c2ccccc2 | 0.3 | 0.25845 | 10.38778 |
| 2-methoxyephedrine | CCNC(Cc1ccccc1)c2ccccc2OC | 0.3 | 0.1981 | 25.47605 |
| 4-methoxyephedrine | CCNC(Cc1ccccc1)c2ccc(OC)cc2 | 0.3 | 0.11573 | 46.06667 |
| 2-methoxyphenidine | COc1ccccc1C(Cc2ccccc2)N3CCCCC3 | 0.4 | 0.02699 | 95.1557 |
| caffeine | CN1C=NC2=C1C(=O)N(C(=O)N2C)C | 0.4 | 0.36895 | 7.92159 |
| paracetamol | CC(=O)NC1=CC=C(C=C1)O | 0.4 | 0.34608 | 13.75513 |

| | | | | |
|--------------------|--|-----|----------|----------|
| sucrose | <chem>OCC2OC(OC1(CO)OC(CO)C(O)C1O)C(O)C(O)C2O</chem> | 0.4 | 0.26263 | 35.04296 |
| aspirin | <chem>CC(=O)Oc1ccccc1C(=O)O</chem> | 0.4 | 0.26053 | 35.58002 |
| crystal violet | <chem>CN(C)c3ccc(C(c1ccc(N(C)C)cc1)=c2ccc(=[N+](C)C)cc2)cc3</chem> | 0.4 | 1.22E-04 | 0.96951 |
| basic blue | <chem>CCNc3ccc(C(c1ccc(N(CC)CC)cc1)=c2ccc(=[N+](CC)CC)cc2)c4ccccc34</chem> | 0.4 | 2.95E-04 | 12.42634 |
| methyl orange | <chem>CN(C)c2ccc(/N=N/c1ccc(S(=O)(=O)[O-])cc1)cc2</chem> | 0.4 | 0.00348 | 0.13005 |
| phenol red | <chem>O=S(=O)([O-])c3ccc(C(c1ccc(O)cc1)=c2ccc(=[OH+])cc2)cc3</chem> | 0.4 | 0.00371 | 0.0734 |
| 4-methoxyphenidine | <chem>COc3ccc(C(Cc1ccccc1)N2CCCCC2)cc3</chem> | 0.4 | 0.2096 | 47.60122 |
| ephedrine | <chem>CCNC(Cc1ccccc1)c2ccccc2</chem> | 0.4 | 0.29354 | 26.61395 |
| 2-methoxyphenidine | <chem>CCNC(Cc1ccccc1)c2ccccc2OC</chem> | 0.4 | 0.30059 | 24.8528 |
| 4-methoxyphenidine | <chem>CCNC(Cc1ccccc1)c2ccc(OC)cc2</chem> | 0.4 | 0.17084 | 57.28889 |
| 2-methoxyphenidine | <chem>COc1ccccc1C(Cc2ccccc2)N3CCCCC3</chem> | 0.5 | 0.03571 | 115.4961 |
| caffeine | <chem>CN1C=NC2=C1C(=O)N(C(=O)N2C)C</chem> | 0.5 | 0.46895 | 7.72454 |
| paracetamol | <chem>CC(=O)NC1=CC=C(C=C1)O</chem> | 0.5 | 0.44008 | 14.90624 |
| sucrose | <chem>OCC2OC(OC1(CO)OC(CO)C(O)C1O)C(O)C(O)C2O</chem> | 0.5 | 0.32105 | 44.51427 |
| aspirin | <chem>CC(=O)Oc1ccccc1C(=O)O</chem> | 0.5 | 0.33211 | 41.76486 |
| crystal violet | <chem>CN(C)c3ccc(C(c1ccc(N(C)C)cc1)=c2ccc(=[N+](C)C)cc2)cc3</chem> | 0.5 | 1.56E-04 | 1.21106 |
| basic blue | <chem>CCNc3ccc(C(c1ccc(N(CC)CC)cc1)=c2ccc(=[N+](CC)CC)cc2)c4ccccc34</chem> | 0.5 | 0.00787 | 18.03348 |
| methyl orange | <chem>CN(C)c2ccc(/N=N/c1ccc(S(=O)(=O)[O-])cc1)cc2</chem> | 0.5 | 0.00439 | 0.15146 |
| phenol red | <chem>O=S(=O)([O-])c3ccc(C(c1ccc(O)cc1)=c2ccc(=[OH+])cc2)cc3</chem> | 0.5 | 0.00467 | 0.08296 |
| 4-methoxyphenidine | <chem>COc3ccc(C(Cc1ccccc1)N2CCCCC2)cc3</chem> | 0.5 | 0.25768 | 60.58016 |
| ephedrine | <chem>CCNC(Cc1ccccc1)c2ccccc2</chem> | 0.5 | 0.38583 | 28.54203 |
| 2-methoxyphenidine | <chem>CCNC(Cc1ccccc1)c2ccccc2OC</chem> | 0.5 | 0.37065 | 32.33665 |
| 4-methoxyphenidine | <chem>CCNC(Cc1ccccc1)c2ccc(OC)cc2</chem> | 0.5 | 0.22036 | 69.91111 |

Supplementary Table S2. NIP training data set

| Molecule | SMILE | C _i / mM | C _f / mM | S _b / μmol g ⁻¹ |
|--------------------|--|---------------------|---------------------|---------------------------------------|
| 2-methoxyphenidine | <chem>COc1ccccc1C(Cc2ccccc2)N3CCCCC3</chem> | 0.1 | 0.01178 | 21.20633 |
| caffeine | <chem>CN1C=NC2=C1C(=O)N(C(=O)N2C)C</chem> | 0.1 | 0.19684 | 0.78947 |
| paracetamol | <chem>CC(=O)NC1=CC=C(C=C1)O</chem> | 0.1 | 0.0753 | 6.17389 |
| sucrose | <chem>OCC2OC(OC1(CO)OC(CO)C(O)C1O)C(O)C(O)C2O</chem> | 0.1 | 0.04737 | 13.15789 |
| aspirin | <chem>CC(=O)Oc1ccccc1C(=O)O</chem> | 0.1 | 0.05789 | 10.52632 |
| crystal violet | <chem>CN(C)c3ccc(C(c1ccc(N(C)C)cc1)=c2ccc(=[N+](C)C)cc2)cc3</chem> | 0.1 | 8.44E-05 | 0.22889 |
| basic blue | <chem>CCNc3ccc(C(c1ccc(N(CC)CC)cc1)=c2ccc(=[N+](CC)CC)cc2)c4ccccc34</chem> | 0.1 | 0 | 2.5 |
| methyl orange | <chem>CN(C)c2ccc(/N=N/c1ccc(S(=O)(=O)[O-])cc1)cc2</chem> | 0.1 | 7.00E-04 | 0.07496 |
| phenol red | <chem>O=S(=O)([O-])c3ccc(C(c1ccc(O)cc1)=c2ccc(=[OH+])cc2)cc3</chem> | 0.1 | 7.71E-04 | 0.05737 |
| 4-methoxyphenidine | <chem>COc3ccc(C(Cc1ccccc1)N2CCCCC2)cc3</chem> | 0.1 | 0.01631 | 20.92351 |
| ephedrine | <chem>CCNC(Cc1ccccc1)c2ccccc2</chem> | 0.1 | 0.12101 | 19.7479 |
| 2-methoxyphenidine | <chem>CCNC(Cc1ccccc1)c2ccccc2OC</chem> | 0.1 | 0.06646 | 58.38509 |
| 4-methoxyphenidine | <chem>CCNC(Cc1ccccc1)c2ccc(OC)cc2</chem> | 0.1 | 0.00522 | 23.69506 |
| 2-methoxyphenidine | <chem>COc1ccccc1C(Cc2ccccc2)N3CCCCC3</chem> | 0.2 | 0.02416 | 42.47235 |
| caffeine | <chem>CN1C=NC2=C1C(=O)N(C(=O)N2C)C</chem> | 0.2 | 0.28947 | 2.63158 |
| paracetamol | <chem>CC(=O)NC1=CC=C(C=C1)O</chem> | 0.2 | 0.15915 | 10.21149 |
| sucrose | <chem>OCC2OC(OC1(CO)OC(CO)C(O)C1O)C(O)C(O)C2O</chem> | 0.2 | 0.10526 | 23.68421 |
| aspirin | <chem>CC(=O)Oc1ccccc1C(=O)O</chem> | 0.2 | 0.1 | 25 |
| crystal violet | <chem>CN(C)c3ccc(C(c1ccc(N(C)C)cc1)=c2ccc(=[N+](C)C)cc2)cc3</chem> | 0.2 | 1.11E-04 | 0.47232 |
| basic blue | <chem>CCNc3ccc(C(c1ccc(N(CC)CC)cc1)=c2ccc(=[N+](CC)CC)cc2)c4ccccc34</chem> | 0.2 | 0 | 5 |
| methyl orange | <chem>CN(C)c2ccc(/N=N/c1ccc(S(=O)(=O)[O-])cc1)cc2</chem> | 0.2 | 0.0013 | 0.17605 |
| phenol red | <chem>O=S(=O)([O-])c3ccc(C(c1ccc(O)cc1)=c2ccc(=[OH+])cc2)cc3</chem> | 0.2 | 0.0017 | 0.07396 |
| 4-methoxyphenidine | <chem>COc3ccc(C(Cc1ccccc1)N2CCCCC2)cc3</chem> | 0.2 | 0.07264 | 31.84109 |
| ephedrine | <chem>CCNC(Cc1ccccc1)c2ccccc2</chem> | 0.2 | 0.09076 | 52.31092 |
| 2-methoxyphenidine | <chem>CCNC(Cc1ccccc1)c2ccccc2OC</chem> | 0.2 | 0.14472 | 63.81988 |
| 4-methoxyphenidine | <chem>CCNC(Cc1ccccc1)c2ccc(OC)cc2</chem> | 0.2 | 0.06264 | 34.34075 |
| 2-methoxyphenidine | <chem>COc1ccccc1C(Cc2ccccc2)N3CCCCC3</chem> | 0.3 | 0.03859 | 67.72254 |
| caffeine | <chem>CN1C=NC2=C1C(=O)N(C(=O)N2C)C</chem> | 0.3 | 0.38421 | 3.88903 |
| paracetamol | <chem>CC(=O)NC1=CC=C(C=C1)O</chem> | 0.3 | 0.25742 | 10.64409 |
| sucrose | <chem>OCC2OC(OC1(CO)OC(CO)C(O)C1O)C(O)C(O)C2O</chem> | 0.3 | 0.15789 | 35.52632 |
| aspirin | <chem>CC(=O)Oc1ccccc1C(=O)O</chem> | 0.3 | 0.16842 | 32.89474 |
| crystal violet | <chem>CN(C)c3ccc(C(c1ccc(N(C)C)cc1)=c2ccc(=[N+](C)C)cc2)cc3</chem> | 0.3 | 1.16E-04 | 0.72092 |
| basic blue | <chem>CCNc3ccc(C(c1ccc(N(CC)CC)cc1)=c2ccc(=[N+](CC)CC)cc2)c4ccccc34</chem> | 0.3 | 0 | 7.5 |
| methyl orange | <chem>CN(C)c2ccc(/N=N/c1ccc(S(=O)(=O)[O-])cc1)cc2</chem> | 0.3 | 0.00224 | 0.19093 |
| phenol red | <chem>O=S(=O)([O-])c3ccc(C(c1ccc(O)cc1)=c2ccc(=[OH+])cc2)cc3</chem> | 0.3 | 0.00271 | 0.07227 |
| 4-methoxyphenidine | <chem>COc3ccc(C(Cc1ccccc1)N2CCCCC2)cc3</chem> | 0.3 | 0.08449 | 53.87637 |
| ephedrine | <chem>CCNC(Cc1ccccc1)c2ccccc2</chem> | 0.3 | 0.22185 | 44.53782 |
| 2-methoxyphenidine | <chem>CCNC(Cc1ccccc1)c2ccccc2OC</chem> | 0.3 | 0.24845 | 62.8882 |
| 4-methoxyphenidine | <chem>CCNC(Cc1ccccc1)c2ccc(OC)cc2</chem> | 0.3 | 0.09082 | 52.29408 |
| 2-methoxyphenidine | <chem>COc1ccccc1C(Cc2ccccc2)N3CCCCC3</chem> | 0.4 | 0.05476 | 85.0343 |
| caffeine | <chem>CN1C=NC2=C1C(=O)N(C(=O)N2C)C</chem> | 0.4 | 0.47684 | 5.78947 |
| paracetamol | <chem>CC(=O)NC1=CC=C(C=C1)O</chem> | 0.4 | 0.34875 | 12.62309 |
| sucrose | <chem>OCC2OC(OC1(CO)OC(CO)C(O)C1O)C(O)C(O)C2O</chem> | 0.4 | 0.26316 | 33.70495 |
| aspirin | <chem>CC(=O)Oc1ccccc1C(=O)O</chem> | 0.4 | 0.25789 | 35.0013 |
| crystal violet | <chem>CN(C)c3ccc(C(c1ccc(N(C)C)cc1)=c2ccc(=[N+](C)C)cc2)cc3</chem> | 0.4 | 1.18E-04 | 0.97045 |

| | | | | |
|--------------------|---|-----|----------|----------|
| basic blue | CCNc3ccc(C(c1ccc(N(CC)CC)cc1)=c2ccc(=[N+])(CC)CC)cc2)c4cccc34 | 0.4 | 1.07E-04 | 12.47321 |
| methyl orange | CN(C)c2ccc(/N=N/c1ccc(S(=O)(=O)[O-])cc1)cc2 | 0.4 | 0.00319 | 0.20189 |
| phenol red | O=S(=O)([O-])c3ccc(C(c1ccc(O)cc1)=c2ccc(=[OH+])cc2)cc3 | 0.4 | 0.00364 | 0.08886 |
| 4-methoxyphenidine | COc3ccc(C(Cc1cccc1)N2CCCCC2)cc3 | 0.4 | 0.15565 | 61.08805 |
| ephenidine | CCNC(Cc1cccc1)c2cccc2 | 0.4 | 0.25882 | 60.29412 |
| 2-methoxyphenidine | CCNC(Cc1cccc1)c2cccc2OC | 0.4 | 0.46522 | 33.03495 |
| 4-methoxyphenidine | CCNC(Cc1cccc1)c2ccc(OC)cc2 | 0.4 | 0.21192 | 47.01952 |
| 2-methoxyphenidine | COc1cccc1C(Cc2cccc2)N3CCCCC3 | 0.5 | 0.0877 | 98.63604 |
| caffeine | CN1C=NC2=C1C(=O)N(C(=O)N2C)C | 0.5 | 0.55632 | 10.70691 |
| paracetamol | CC(=O)NC1=CC=C(C=C1)O | 0.5 | 0.44115 | 14.71374 |
| sucrose | OCC2OC(OC1(CO)OC(CO)C(O)C1O)C(O)C(O)C2O | 0.5 | 0.33158 | 42.10526 |
| aspirin | CC(=O)Oc1cccc1C(=O)O | 0.5 | 0.33684 | 40.78947 |
| crystal violet | CN(C)c3ccc(C(c1ccc(N(C)C)cc1)=c2ccc(=[N+])(C)CC)cc3 | 0.5 | 1.58E-04 | 1.2106 |
| basic blue | CCNc3ccc(C(c1ccc(N(CC)CC)cc1)=c2ccc(=[N+])(CC)CC)cc2)c4cccc34 | 0.5 | 0.00135 | 19.66295 |
| methyl orange | CN(C)c2ccc(/N=N/c1ccc(S(=O)(=O)[O-])cc1)cc2 | 0.5 | 0.00409 | 0.22853 |
| phenol red | O=S(=O)([O-])c3ccc(C(c1ccc(O)cc1)=c2ccc(=[OH+])cc2)cc3 | 0.5 | 0.00457 | 0.10686 |
| 4-methoxyphenidine | COc3ccc(C(Cc1cccc1)N2CCCCC2)cc3 | 0.5 | 0.28313 | 54.21731 |
| ephenidine | CCNC(Cc1cccc1)c2cccc2 | 0.5 | 0.39328 | 50.66733 |
| 2-methoxyphenidine | CCNC(Cc1cccc1)c2cccc2OC | 0.5 | 0.3559 | 86.02484 |
| 4-methoxyphenidine | CCNC(Cc1cccc1)c2ccc(OC)cc2 | 0.5 | 0.24115 | 64.71187 |

Supplementary Table S3. MIP testing data set

| Molecule | SMILE | C _i / mM | C _f / mM | S _b / μmol g ⁻¹ |
|-------------|------------------------------------|---------------------|---------------------|---------------------------------------|
| 3-MXP | COc3ccc(C(Cc1cccc1)N2CCCCC2)c3 0.1 | 0.1 | 35.75 | 16.06232 |
| Diphenidine | c3ccc(CC(c1cccc1)N2CCCCC2)cc3 0.1 | 0.1 | 77.83 | 5.54237 |
| 3-MEPE | CCNC(Cc1cccc1)c2cccc(OC)c2 | 0.1 | 331.93 | 15.5798 |
| 3-MXP | COc3ccc(C(Cc1cccc1)N2CCCCC2)c3 0.1 | 0.2 | 0.06604 | 33.48929 |
| Diphenidine | c3ccc(CC(c1cccc1)N2CCCCC2)cc3 0.1 | 0.2 | 0.16827 | 7.9322 |
| 3-MEPE | CCNC(Cc1cccc1)c2cccc(OC)c2 | 0.2 | 0.07211 | 31.97227 |
| 3-MXP | COc3ccc(C(Cc1cccc1)N2CCCCC2)c3 | 0.3 | 0.10893 | 47.76708 |
| Diphenidine | c3ccc(CC(c1cccc1)N2CCCCC2)cc3 | 0.3 | 0.21559 | 21.10169 |
| 3-MEPE | CCNC(Cc1cccc1)c2cccc(OC)c2 | 0.3 | 0.12196 | 44.50876 |
| 3-MXP | COc3ccc(C(Cc1cccc1)N2CCCCC2)c3 | 0.4 | 0.1577 | 60.57525 |
| Diphenidine | c3ccc(CC(c1cccc1)N2CCCCC2)cc3 | 0.4 | 0.23607 | 40.98305 |
| 3-MEPE | CCNC(Cc1cccc1)c2cccc(OC)c2 | 0.4 | 0.26118 | 34.70545 |
| 3-MXP | COc3ccc(C(Cc1cccc1)N2CCCCC2)c3 | 0.5 | 0.2157 | 71.07402 |
| Diphenidine | c3ccc(CC(c1cccc1)N2CCCCC2)cc3 | 0.5 | 0.31878 | 45.30508 |
| 3-MEPE | CCNC(Cc1cccc1)c2cccc(OC)c2 | 0.5 | 0.33193 | 42.01771 |
| 3-MXP | COc3ccc(C(Cc1cccc1)N2CCCCC2)c3 0.1 | 0.1 | 35.75 | 16.06232 |
| Diphenidine | c3ccc(CC(c1cccc1)N2CCCCC2)cc3 0.1 | 0.1 | 77.83 | 5.54237 |
| 3-MEPE | CCNC(Cc1cccc1)c2cccc(OC)c2 | 0.1 | 331.93 | 15.5798 |
| 3-MXP | COc3ccc(C(Cc1cccc1)N2CCCCC2)c3 0.1 | 0.2 | 0.06604 | 33.48929 |
| Diphenidine | c3ccc(CC(c1cccc1)N2CCCCC2)cc3 0.1 | 0.2 | 0.16827 | 7.9322 |
| 3-MEPE | CCNC(Cc1cccc1)c2cccc(OC)c2 | 0.2 | 0.07211 | 31.97227 |
| 3-MXP | COc3ccc(C(Cc1cccc1)N2CCCCC2)c3 | 0.3 | 0.10893 | 47.76708 |
| Diphenidine | c3ccc(CC(c1cccc1)N2CCCCC2)cc3 | 0.3 | 0.21559 | 21.10169 |
| 3-MEPE | CCNC(Cc1cccc1)c2cccc(OC)c2 | 0.3 | 0.12196 | 44.50876 |
| 3-MXP | COc3ccc(C(Cc1cccc1)N2CCCCC2)c3 | 0.4 | 0.1577 | 60.57525 |
| Diphenidine | c3ccc(CC(c1cccc1)N2CCCCC2)cc3 | 0.4 | 0.23607 | 40.98305 |
| 3-MEPE | CCNC(Cc1cccc1)c2cccc(OC)c2 | 0.4 | 0.26118 | 34.70545 |
| 3-MXP | COc3ccc(C(Cc1cccc1)N2CCCCC2)c3 | 0.5 | 0.2157 | 71.07402 |
| Diphenidine | c3ccc(CC(c1cccc1)N2CCCCC2)cc3 | 0.5 | 0.31878 | 45.30508 |
| 3-MEPE | CCNC(Cc1cccc1)c2cccc(OC)c2 | 0.5 | 0.33193 | 42.01771 |

Supplementary Table S4. NIP testing data set

| Molecule | SMILE | C _i / mM | C _f / mM | S _b / μmol g ⁻¹ |
|-------------|------------------------------------|---------------------|---------------------|---------------------------------------|
| 3-MXP | COc3ccc(C(Cc1cccc1)N2CCCCC2)c3 0.1 | 0.1 | 0.05416 | 11.45973 |
| Diphenidine | c3ccc(CC(c1cccc1)N2CCCCC2)cc3 0.1 | 0.1 | 0.09503 | 1.24327 |
| 3-MEPE | CCNC(Cc1cccc1)c2cccc(OC)c2 | 0.1 | 0.05592 | 11.01974 |
| 3-MXP | COc3ccc(C(Cc1cccc1)N2CCCCC2)c3 0.1 | 0.2 | 0.09667 | 25.83134 |
| Diphenidine | c3ccc(CC(c1cccc1)N2CCCCC2)cc3 0.1 | 0.2 | 0.11086 | 22.28381 |
| 3-MEPE | CCNC(Cc1cccc1)c2cccc(OC)c2 | 0.2 | 0.08355 | 2.91E+01 |
| 3-MXP | COc3ccc(C(Cc1cccc1)N2CCCCC2)c3 | 0.3 | 0.11007 | 47.48267 |
| Diphenidine | c3ccc(CC(c1cccc1)N2CCCCC2)cc3 | 0.3 | 0.18055 | 29.86221 |
| 3-MEPE | CCNC(Cc1cccc1)c2cccc(OC)c2 | 0.3 | 0.14539 | 38.65132 |
| 3-MXP | COc3ccc(C(Cc1cccc1)N2CCCCC2)c3 | 0.4 | 0.14385 | 64.0382 |

| | | | | |
|-------------|--------------------------------------|-----|---------|----------|
| Diphenidine | c3ccc(CC(c1ccccc1)N2CCCCC2)cc3 | 0.4 | 0.31992 | 20.01901 |
| 3-MEPE | CCNC(Cc1ccccc1)c2cccc(OC)c2 | 0.4 | 0.20461 | 48.84868 |
| 3-MXP | COc3cccc(C(Cc1ccccc1)N2CCCCC2)c3 | 0.5 | 0.26032 | 59.91934 |
| Diphenidine | c3ccc(CC(c1ccccc1)N2CCCCC2)cc3 | 0.5 | 0.19639 | 75.90276 |
| 3-MEPE | CCNC(Cc1ccccc1)c2cccc(OC)c2 | 0.5 | 0.29671 | 50.82237 |
| 3-MXP | COc3cccc(C(Cc1ccccc1)N2CCCCC2)c3 0.1 | 0.1 | 0.05416 | 11.45973 |
| Diphenidine | c3ccc(CC(c1ccccc1)N2CCCCC2)cc3 0.1 | 0.1 | 0.09503 | 1.24327 |
| 3-MEPE | CCNC(Cc1ccccc1)c2cccc(OC)c2 | 0.1 | 0.05592 | 11.01974 |
| 3-MXP | COc3cccc(C(Cc1ccccc1)N2CCCCC2)c3 0.1 | 0.2 | 0.09667 | 25.83134 |
| Diphenidine | c3ccc(CC(c1ccccc1)N2CCCCC2)cc3 0.1 | 0.2 | 0.11086 | 22.28381 |
| 3-MEPE | CCNC(Cc1ccccc1)c2cccc(OC)c2 | 0.2 | 0.08355 | 2.91E+01 |
| 3-MXP | COc3cccc(C(Cc1ccccc1)N2CCCCC2)c3 | 0.3 | 0.11007 | 47.48267 |
| Diphenidine | c3ccc(CC(c1ccccc1)N2CCCCC2)cc3 | 0.3 | 0.18055 | 29.86221 |
| 3-MEPE | CCNC(Cc1ccccc1)c2cccc(OC)c2 | 0.3 | 0.14539 | 38.65132 |
| 3-MXP | COc3cccc(C(Cc1ccccc1)N2CCCCC2)c3 | 0.4 | 0.14385 | 64.0382 |
| Diphenidine | c3ccc(CC(c1ccccc1)N2CCCCC2)cc3 | 0.4 | 0.31992 | 20.01901 |
| 3-MEPE | CCNC(Cc1ccccc1)c2cccc(OC)c2 | 0.4 | 0.20461 | 48.84868 |
| 3-MXP | COc3cccc(C(Cc1ccccc1)N2CCCCC2)c3 | 0.5 | 0.26032 | 59.91934 |
| Diphenidine | c3ccc(CC(c1ccccc1)N2CCCCC2)cc3 | 0.5 | 0.19639 | 75.90276 |
| 3-MEPE | CCNC(Cc1ccccc1)c2cccc(OC)c2 | 0.5 | 0.29671 | 50.82237 |