**Examplary SOP: MD Simulations**

Membrane simulation: yes/no

Cycles of minimization: XX

<Section|Preparation and Environment>

The variants were protonated with {PROPKA| protonation method} according to {7.4| pH}, neutralized by adding counterions.

<if|membrane simulation|e|true>, The variants were embedded in a membrane consisting of {POPC|Lipid type} lipids and solvated in a {rectangular|box type} water box using {TIP3P|water type} with a minimal shell of {12 Å|shell radius} around the solute. <elif|membrane simulation|e|false>, the variants were solvated in an {octahedral|box type} water box using {TIP3P|water type} with a minimal shell of {12 Å|shell radius} around the solute.

All atom {molecular dynamics (MD)|simulation} simulations were performed using the {AMBER14|suite} suite.

<if|water type|e|TIP3P>, The {ff14SB|force field} force field was used. <elif|water type|e|OPC>, The {ff19SB|force field} force field was used.

<if|membrane simulation|e|true>, the force field is used in combination with a {LIPID14|force field} force field

<if|membrane simulation|e|true> During the {thermalization|period}, the time step for all MD simulations was set to {2 fs|dt} with a direct space, nonbonded cutoff of {9 Å|cut}. During the {production|period}, the time step for all MD simulations was set to {4 fs|dt} as hydrogen mass repartitioning was used with a direct-space, non-bonded cutoff of {8 Å|cut}. <elif|membrane simulation|e|false>, the time step for all MD simulations was set to {4 fs|dt} as hydrogen mass repartitioning was used with a direct-space, non-bonded cutoff of {8 Å|cut}.

To cope with long-range interactions, the Particle Mesh Ewald method was used; the SHAKE algorithm was applied to bonds involving hydrogen atoms.

<Section|Minimization>

At the beginning, {17,500|maxcyc} steps of steepest descent and conjugate gradient minimization were performed.

<for each|cycles of minimization> print {2500|maxcyc}, steps of minimization were performed.

During these steps positional harmonic restraints with a force constant of <for each|cycles of minimization> print {25 kcal mol-1 Å-2|restraint\_wt} were applied to solute atoms.

<Section|Thermalization>

Thereafter, {50 ps|simulation time} of {NVT|MD} simulations were conducted.

The system was then heated up to {100 K|temp0}.

The previous step is followed by {300 ps|simulation time} simulations to adjust the density of the simulation box to a pressure of {1 atm|pres0} and to heat the system to {300 K|temp0}. During these steps, a harmonic potential with a force constant of {10 kcal mol-1 Å-2|restraint\_wt} was applied to the solute atoms.

As the final step in thermalization, {300 ps|simulation time} {NVT|MD} MD simulations were performed.

During this process, the restraint forces on solute atoms were gradually reduced to {0 kcal mol-1 Å-2|restraint\_wt} within the first {100 ps|simulation time}.

<Section|Production>

Afterward, {5|overall repetitions} replicas of independent production {NVT|MD} simulations were performed.

For each production run, simulations of {2 ns|simulation time} were performed.