Figure 7–source data 1. Survey of measured viscosity for DMPC lipid membranes

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Membrane systema | Temperature (K) | Measurement method | Membrane viscosity (*η*m,mPa·s)b | Diffusion coefficient (*D*m,μm2/s)c | Viscosity ratio  (*η*m/*η*w) |
| SUV | 298 | Neutron spin echo spectroscopy1 | ~20113d |  | 22599 |
| SUV | 298 | Picosecond time-resolved fluorescence spectroscopy2 | 97e |  | 109 |
| SUV | 291 | Picosecond time-resolved fluorescence spectroscopy2 | ~1200e |  | 1200 |
| LUV | 295 | Fluorescence lifetime spectroscopy and imaging3 | ~280 |  | 280 |
| GUV | 298 | Optical dynamometry4 | 3486d |  | 3917 |
| MLV | 298 | Electron spin resonance5 | 223, 64, 63f |  | 250, 72, 70 |
| SLB | 298 | Pulsed field gradient 1H NMR6 |  | 5.70 | 404g |

a SUV, LUV, GUV, MLV, and SLB indicate the small unilamellar vesicle, large unilamellar vesicle, giant unilamellar vesicle, multilamellar vesicle, and supported lipid bilayer, respectively. b For comparison, the dynamic viscosity of water (*η*w) is approximately 0.89 mPa·s at 298K. c For comparison, the diffusion coefficient of water (*D*w) is approximately 2.3103 μm2/s at 298K. d The surface shear viscosity (*η*s) in the original reference was converted to the bulk membrane viscosity (*η*m) by the relation *η*s = *η*m*h* (ref. 4), where *h* is the DMPC membrane thickness of ~3.7 nm for SUV and MLV (refs. 7,8). e The values are those from the later steady-state lifetimes in fluorescence decay curves. f The values are those measured at three different bilayer depths. g The viscosity ratio was calculated using the Einstein relation.

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