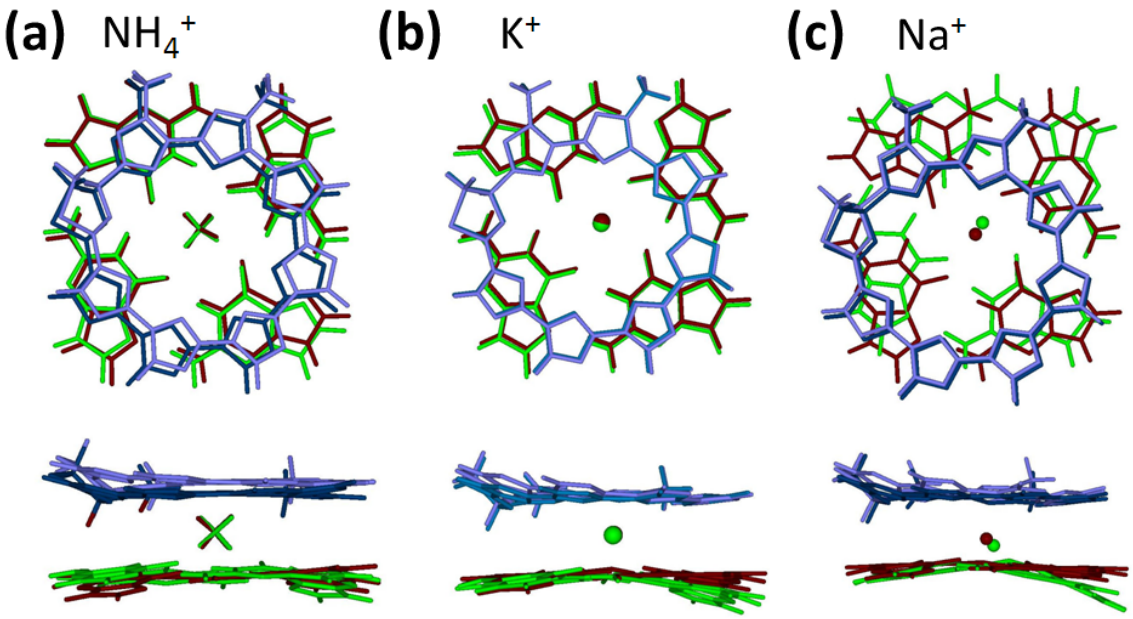
# Cation Involvement in Telomestatin Binding to G-Quadruplex DNA

Valérie Gabelica[1,2*], Frédéric Rosu[1,2*], Nicolas Smargiasso[1,2], Gabriel Mazzucchelli[1,2], Kazuo Shin-ya[3], Edwin De Pauw[1,2]

1. Mass Spectrometry Laboratory, Department of Chemistry, University of Liège, Belgium
2. GIGA-Systems Biology and Chemical Biology, University of Liège, Belgium
3. Biomedicinal Information Research Center, National Institute of Advanced Industrial Science and Technology, Biological Systems Control Team, Tokyo, Japan.

*** Joint first authors.**

## Supporting information




**Supporting Information Figure S1:** Manual superimposition of optimized geometry of the ternary complexe telomestatin - cation - G-quartet obtained using B3LYP and MPWB1K functionals (top view and side view). (a) $NH_4^+$, (b) $K^+$, (c) $Na^+$. The B3LYP optimized structures are in green (G-quartet) and purple (telomestatin). The MPWB1K optimized structures are in red (G-tetrad) and blue (telomestatin).

**Supporting Information Table S1:** Comparison of the geometries optimized with the different hybrid functional: root mean square distances (RMSD) of two-by-two comparisons (in Å).

| | Cation + telomestatin complex | Cation + telomestatin + G-quartet complex |
|---|---|---|
| **B3LYP vs BHHLYP** | | |
| **$NH_4^+$** | 0.045 | 0.265 |
| **$K^+$** | 0.045 | 0.131 |
| **$Na^+$** | 0.000 | 0.856 |
| **B3LYP vs MPWB1K** | | |
| **$NH_4^+$** | 0.085 | 0.350 |
| **$K^+$** | 0.083 | 0.276 |
| **$Na^+$** | 0.069 | 0.726 |
| **MPWB1K vs BHHLYP** | | |
| **$NH_4^+$** | 0.054 | 0.302 |
| **$K^+$** | 0.055 | 0.188 |
| **$Na^+$** | 0.069 | 0.573 |

**Supporting Information Table S2:** Interaction energies of $NH_4^+$, $K^+$ and $Na^+$ with telomestatin alone, telomestatin + one G-quartet, computed with DFT, 6-31G(d,p) basis set, and three different hybrid functionals: B3LYP, BHandHLYP, and MPWB1K. The calculation of the interaction energy of the cation in the complex (BSSE corrected) has been calculated using the following equations:

$\Delta E_{int} = E_{(telomestatin+cation)} - E_{(telomestatin)} - E_{(cation)} - E_{(BSSE)}$

$\Delta E_{int} = E_{(G4+telomestatin+cation)} - E_{(G4+telomestatin)} - E_{(cation)} - E_{(BSSE)}$

| | Cation interaction energy with telomestatin alone (kcal/mol) | Cation interaction energy with telomestatin + G-quartet (kcal/mol) |
|---|---|---|
| **B3LYP** | | |
| **$NH_4^+$** | -84.9 | -115.8 |
| **$K^+$** | -82.7 | -119.9 |
| **$Na^+$** | -93.8 | -141.2 |
| **BHandHLYP** | | |
| **$NH_4^+$** | -87.4 | -120.7 |
| **$K^+$** | -86.0 | -117.9 |
| **$Na^+$** | -95.4 | -147.0 |
| **MPWB1K** | | |
| **$NH_4^+$** | -88.1 | -121.6 |
| **$K^+$** | -86.1 | -124.3 |
| **$Na^+$** | -95.6 | -145.6 |