

## **Supplementary Material**

### **The beads-on-a-string structure of long telomeric DNAs under molecular crowding conditions**

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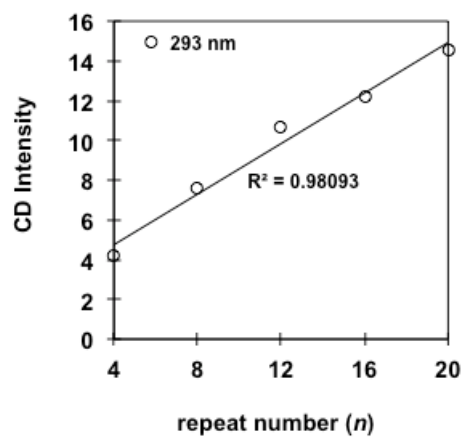
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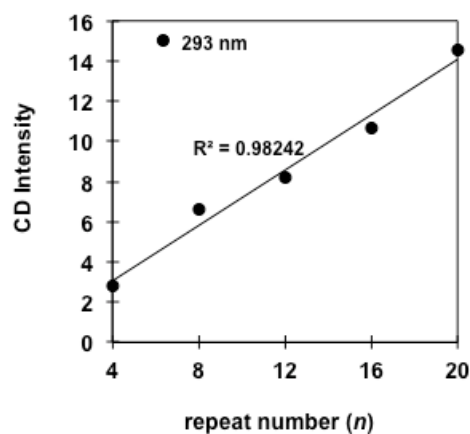
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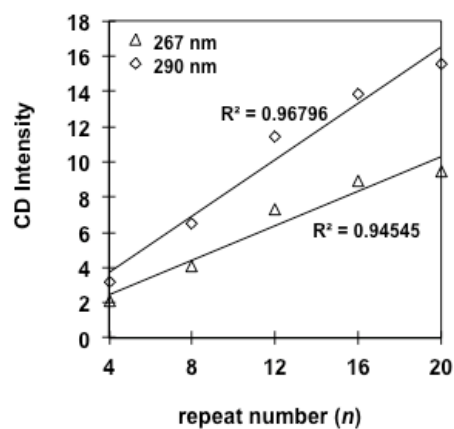
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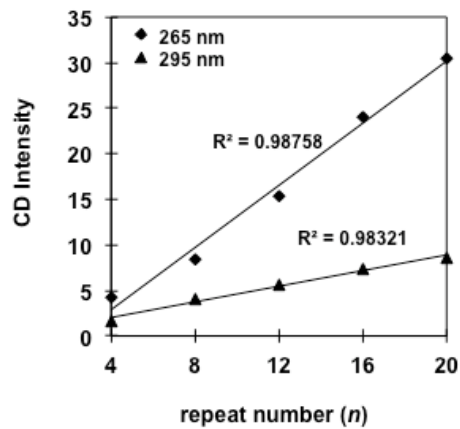
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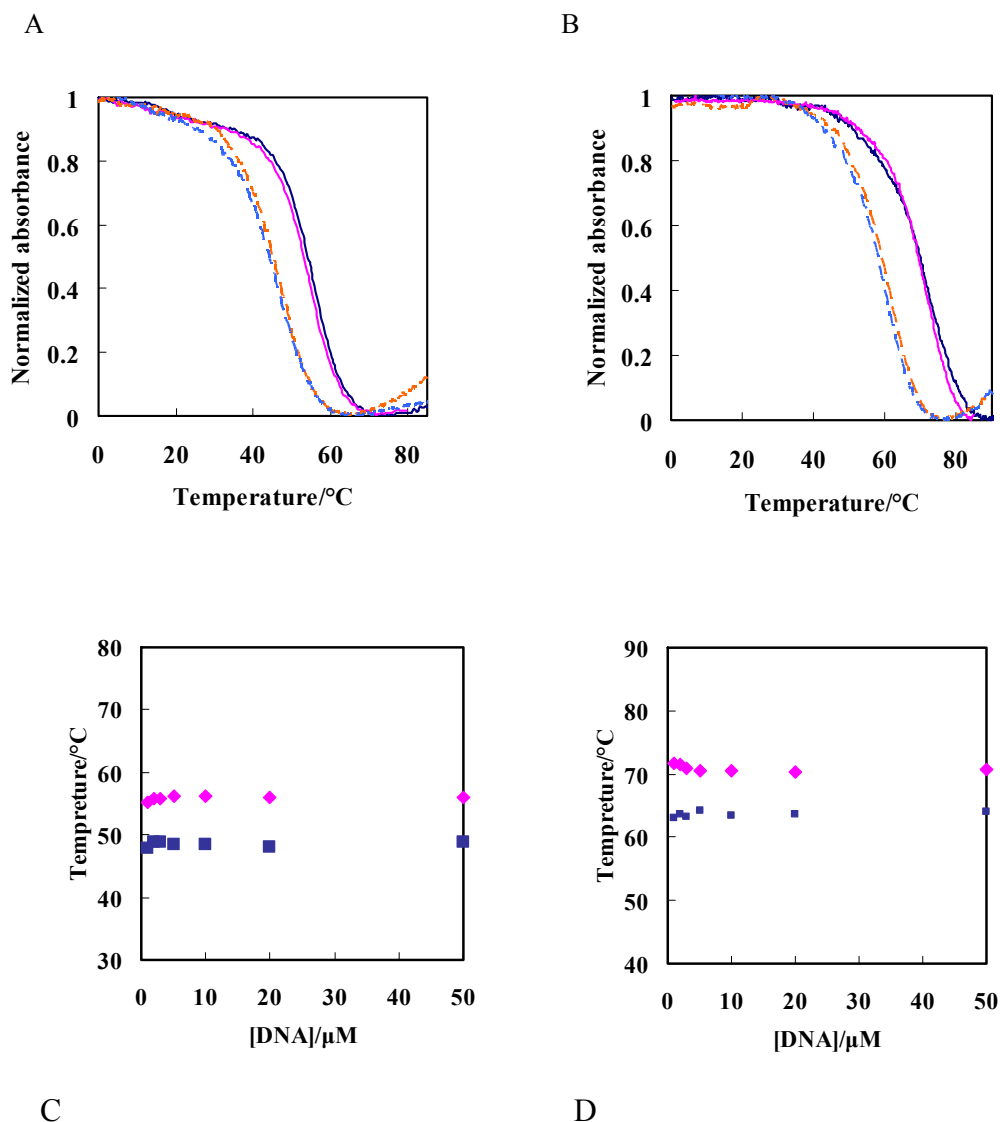
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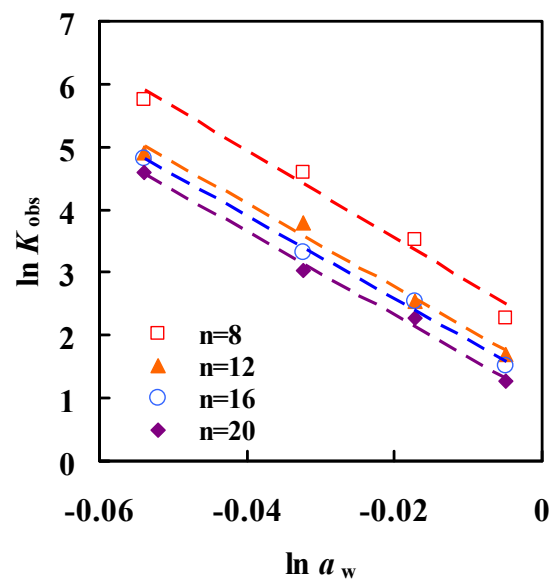


**Figure S1.** Plot of CD intensity versus repeat number of  $(T_2AG_3)_n$  ( $n = 4-20$ ) under the dilute condition in the presence of  $Na^+$  (A); under the molecular crowding condition in the presence of  $Na^+$  (B); under the dilute condition in the presence of  $K^+$  (C); under the molecular crowding condition in the presence of  $K^+$  (D).



**Figure S2.** (A) Normalized UV annealing (orange) and melting (light blue) curves at 295 nm of  $(T_2AG_3)_4$  under the dilute condition in the presence of 100 mM  $Na^+$ . Normalized UV annealing (pink) and melting (blue) curves at 295 nm of  $(T_2AG_3)_4$  under the molecular crowding condition in the presence of 100 mM  $Na^+$ . (B) Normalized UV annealing (orange) and melting (light blue) curves at 295 nm of  $(T_2AG_3)_4$  under the dilute condition in the presence of 100 mM  $K^+$ . Normalized UV annealing (pink) and melting (blue) curves at 295 nm of  $(T_2AG_3)_4$  under the

molecular crowding condition in the presence of 100 mM  $K^+$ . (C) Plot of  $T_m$  versus concentrations of  $(T_2AG_3)_4$  (1–50  $\mu M$  strand concentrations) in 50 mM Tris-HCl buffer (pH 7.0) containing 100 mM  $Na^+$  under the molecular crowding (pink diamond) and dilute (blue square) conditions. (D) Plot of  $T_m$  versus concentrations of  $(T_2AG_3)_4$  (1–50  $\mu M$  strand concentrations) in 50 mM Tris-HCl buffer (pH 7.0) containing 100 mM  $K^+$  under the molecular crowding (pink diamond) and dilute (blue square) conditions.



**Figure S3.** Plot of  $\ln K_{\text{obs}}$  at 37°C versus  $\ln a_w$  for the G-quadruplex formation of  $(\text{T}_2\text{AG}_3)_n$  ( $n = 8-20$ ) in the 50 mM Tris-HCl buffer (pH 7.0) with 100 mM  $\text{Na}^+$  at 0, 10, 20, or 30 wt% PEG 200.