Mechanically controlled DNA extrusion from a palindromic sequence by single molecule micromanipulation.

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Twisting a palindromic DNA molecule (F = constant)

A simple measure of the helical pitch

Results
Twisting a single DNA molecule having a palindromic sequence: experiment.

Principle

Mechanics
Twisting a single DNA molecule having a palindromic sequence: experiment;

F = 0.3 pN  F = 1.3 pN  F = 1.3 pN, torsion increasing  F = 1.3 pN, torsion decreasing
Twisting a single DNA molecule having a palindromic sequence: experiment;

F = 0.3 pN    F = 1.3 pN    F = 1.3 pN, torsion increasing    F = 1.3 pN, torsion decreasing

![Diagram showing the twisting of a single DNA molecule with different forces and torsion conditions.](image-url)
Twisting a single DNA molecule having a palindromic sequence: experiment;

- $F = 0.3 \text{ pN}$
- $F = 1.3 \text{ pN}$
- $F = 1.3 \text{ pN}$, torsion increasing
- $F = 1.3 \text{ pN}$, torsion decreasing

$F = 1.5 \text{ pN}$:
Twisting a single DNA molecule having a palindromic sequence: experiment;

$F = 0.3 \text{ pN}$  $F = 1.3 \text{ pN}$  $F = 1.3 \text{ pN}$, torsion increasing  $F = 1.3 \text{ pN}$, torsion decreasing

**Graph:**
- Ext (µm) on the y-axis
- $\Delta L_k$ on the x-axis
- Lines and markers indicating different forces and conditions.

**Legend:**
- F = 1.5 pN:
Slope dependence versus force applied

![Graph showing Ext (μm) vs. ΔLk with Lk_{tot} and forces of 4.7 pN and 0.08 pN indicated.](image)
Slope versus force = Worm Like Chain model
## DNA pitch and persistence length

### Helical pitch of DNA ($p$) and persistence length ($L_P$)

<table>
<thead>
<tr>
<th>condition</th>
<th>$p$ (nm) ($\pm SD$)</th>
<th>$L_P$ (nm) ($\pm SD$)</th>
<th>number of molecules</th>
</tr>
</thead>
<tbody>
<tr>
<td>standard ($pH$ 8, 37° C)</td>
<td>3.61 ± 0.03</td>
<td>50 ± 2</td>
<td>12</td>
</tr>
<tr>
<td>standard + 0.2 M KGlu$^b$</td>
<td>3.59 ± 0.03</td>
<td>42 ± 2</td>
<td>3</td>
</tr>
<tr>
<td>standard but pH 7</td>
<td>3.59 ± 0.05</td>
<td>45 ± 3</td>
<td>6</td>
</tr>
<tr>
<td>standard but 27° C</td>
<td>3.64 ± 0.06</td>
<td>46 ± 3</td>
<td>2</td>
</tr>
<tr>
<td>standard + 0.1 µM EtBr$^b$</td>
<td>4.12 ± 0.05</td>
<td>52 ± 5</td>
<td>3</td>
</tr>
</tbody>
</table>

$^a$25 mM Tris-Acetate pH 8, 0.5 mM EDTA, 0.1% BSA, 0.01% NaN₃, 37°C

$^b$KGlu: potassium glutamate, EtBr: ethidium bromide