# Contents

*Preface* ..........................................................  
*Contributors* .......................................................... ix  

1 Introduction to Telomeres and Telomerase  
*Zhou Songyang* .......................................................... 1  

2 Analysis of Average Telomere Length in Human Telomeric Protein 
Knockout Cells Generated by CRISPR/Cas9  
*Jun Xu, Zhou Songyang, Dan Liu, and Hyeung Kim* .......................................................... 15  

3 Telomere Length Analysis by Quantitative Fluorescent in Situ 
Hybridization (Q-FISH)  
*Isabelle Ourliac-Garnier and Arturo Londoño-Vallejo* .......................................................... 29  

4 Telomere Strand-Specific Length Analysis by Fluorescent 
In Situ Hybridization (Q-CO-FISH)  
*Isabelle Ourliac-Garnier and Arturo Londoño-Vallejo* .......................................................... 41  

5 Telomere G-Rich Overhang Length Measurement: DSN Method  
*Yong Zhao, Jerry W. Shay, and Woodring E. Wright* .......................................................... 55  

6 Telomere G-Overhang Length Measurement Method 2: G-Tail 
Telomere HPA  
*Hidetoshi Tahara* .......................................................... 63  

7 Telomere Terminal G/C Strand Synthesis: Measuring Telomerase 
Action and C-Rich Fill-In  
*Yong Zhao, Jerry W. Shay, and Woodring E. Wright* .......................................................... 71  

8 Analysis of Yeast Telomerase by Primer Extension Assays  
*Min Hsu and Neal F. Lue* .......................................................... 83  

9 Assessing Telomerase Activities in Mammalian Cells Using the Quantitative 
PCR-Based Telomeric Repeat Amplification Protocol (qTRAP)  
*Shuai Jiang, Mengfan Tang, Huawei Xin, and Junjiu Huang* .......................................................... 95  

10 Telomeres and NextGen CO-FISH: Directional Genomic Hybridization 
(Telo-dGH™)  
*Miles J. McKenna, Erin Robinson, Edwin H. Goodwin, Michael N. Cornforth, and Susan M. Bailey* .......................................................... 103  

11 Visualization of Human Telomerase Localization 
by Fluorescence Microscopy Techniques  
*Eladio Abreu, Rebecca M. Terns, and Michael P. Terns* .......................................................... 113  

12 Cytogenetic Analysis of Telomere Dysfunction  
*Rekha Rai, Asha S. Multani, and Sandy Chang* .......................................................... 127  

13 Probing the Telomere Damage Response  
*Rekha Rai and Sandy Chang* .......................................................... 133
<table>
<thead>
<tr>
<th>Chapter</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>14</td>
<td>Induction of Site-Specific Oxidative Damage at Telomeres by Killerred-Fused Shelretin Proteins</td>
<td>139</td>
</tr>
<tr>
<td>15</td>
<td>Using Protein-Fragment Complementation Assays (PCA) and Peptide Arrays to Study Telomeric Protein-Protein Interactions</td>
<td>147</td>
</tr>
<tr>
<td>16</td>
<td>In Vitro Preparation and Crystallization of Vertebrate Telomerase Subunits</td>
<td>161</td>
</tr>
<tr>
<td>17</td>
<td>Human Telomeric G-Quadruplex Structures and G-Quadruplex-Interactive Compounds</td>
<td>171</td>
</tr>
<tr>
<td>18</td>
<td>Analysis of Telomere-Homologous DNA with Different Conformations Using 2D Agarose Electrophoresis and In-Gel Hybridization</td>
<td>197</td>
</tr>
<tr>
<td>19</td>
<td>Analysis of Telomere Proteins by Chromatin Immunoprecipitation (ChIP)</td>
<td>205</td>
</tr>
<tr>
<td></td>
<td>Index</td>
<td>215</td>
</tr>
</tbody>
</table>
Telomeres and Telomerase
Methods and Protocols
SONGYANG, Z. (Ed.)
2017, XI, 218 p. 37 illus., 18 illus. in color., Hardcover
ISBN: 978-1-4939-6891-6
A product of Humana Press