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High-Throughput Direct-Measurement of Telomere Length

Telomeres are linear chromosome end-capping repetitive DNA sequences. They serve to protect the ends of chromosomes from undesirable fusion events, thus integrity and length are crucial for stability. Natural attrition as well as mutations can affect telomere integrity and length resulting in chromosome instability, senescence, cell death and human diseases. As such, evaluating telomere length is of great interest, not only for understanding fundamental telomere biology, but also as a biomarker for predicting risk for age-related diseases and mortality. It may also be useful in determining treatment decision for certain diseases. However, accurate, reliable and absolute length measurements are needed for telomere assessments to have useful utility.

Researchers at Arizona State University have developed a revolutionary method that directly measures the telomere-absolute-length of individual chromosomes at single nucleotide and single-cell resolution using nanopore technology. This method does not require PCR amplification or fluorescent probe hybridization. Further a large number of DNA samples can be processed, pooled and purified for analysis in a single assay, making it high throughput and exceptionally cost-effective.

This high throughput method to measure telomere absolute length is both cost-effective and competitive in the current telomere-measurement market.

Potential Applications

- Telomere-absolute-length measurements
  - Screening to identify patients with short-telomere diseases for diagnosis and early treatment
  - Predicting risk for many diseases (genetic, age-related, cancer, etc.)
  - Could help determine treatment decisions for certain diseases
  - Provide insights into telomere dynamics and regulations in different cell types and tissues in healthy individuals or patients

Benefits and Advantages

- Allows for direct and absolute measurement of telomere length without any PCR amplification or fluorescent probe hybridization
  - Greater accuracy
  - Fully scalable
- Performed in a high-throughput format using 96-well plates
- Highly cost-effective and competitive
- Can measure individual telomeres at single-nucleotide and single-cell resolution
- Rapid measurement from a large population
- Works on individual cells as well as cells of a large population of individuals

For more information about the inventor(s) and their research, please see

Dr. Chen's departmental webpage

Dr. Chen’s laboratory webpage