Skysong Innovations
Advancing the Arizona State University Knowledge Enterprise

1475 N. Scottsdale Road, Suite 200
Scottsdale, AZ 85287-3538
Phone: 480 884 1996 Fax: 480 884 1984

Case ID:M16-015LC
Published: 6/21/2017

Inventors

Fusheng Xiong

Wayne Frasch

Contact

Jovan Heusser
jovan.heusser@skysonginnovations.com

Probes and Methods for Measuring Tandem Repeats

Telomeres, tandem repeats at the ends of chromatids, are a particular point of interest in the science of aging and cancer. Telomeric DNA is lost during cellular replication, resulting in shortened chromatid length and cessation of cell division. Many age-related diseases are linked to shortened telomeres. Conversely, many cancer cells demonstrate elongated telomeres, resulting in uncontrolled and rampant growth. The ability to measure the lengths of tandem repeats and telomeric length is a powerful diagnostic and research tool. Currently, none of the methods available are capable of accurately measuring telomere length in single cells and are too error-prone to be used diagnostically.

Researchers at Arizona State University have developed a nucleic acid probe and method for measuring telomere length, which may be applied at the single cell level. This system is configured to target specific DNA sequences such as telomere sequences. It is compatible with standard qRT-PCR, and can be completed in less than 30 minutes. The probes are constructed such that they discriminate the telomere from the subtelomere DNA for accurate calculation of telomere length. Validation was performed by calculating absolute telomere length of four human cell lines of known telomere length.

This technology provides an accurate and efficient way to calculate the length of tandem repeats such as telomeres in single cells and potentially in individual chromosomes.

Potential Applications

- Early stage diagnostic testing for age-related diseases
  - Early detection of cells potentially near senescence
- Early diagnosis of cancer
- Research fields involving tandem repeats
  - Gerontology
  - Stem cell technology
  - Cancer

- Forensics

Benefits and Advantages

- Allows for high-throughput capability for the analysis of large numbers of samples, which is a practical necessity in hospitals
- Advantages over terminal restriction fragment (TRF) analysis:
  - Can be performed on single cells. TRF analysis requires >105 cells
  - Eliminates interference of interstitial telomeric sequences
  - Can accurately measure short telomeres, important in aging studies.
- Advantages over fluorescence in situ hybridization (FISH) methods:
  - Rapid and accurate quantification (< 30 minutes)
  - No minimum telomere length threshold
- Advantages over PCR approaches
  - Avoids the complications of heterogeneous amplification
  - Higher-resolution PCR approaches are limited by the maximum length amplifiable by PCR (~25 kb)

For more information about the inventor(s) and their research, please see Dr. Frasch's laboratory webpage