

# Abstract

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## Telomere length measurement-Caveats and a critical assessment of the available technologies and tools.

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**BACKGROUND:** Studies of telomeres and telomere biology often critically rely on the detection of telomeric DNA and measurements of the length of telomere repeats in either single cells or populations of cells. Several methods are available that provide this type of information and it is often not clear what method is most appropriate to address a specific research question. The major variables that need to be considered are the material that is or can be made available and the accuracy of measurements that is required.

**OBJECTIVE:** The goal of this review is to provide a comprehensive summary of the most commonly used methods and discuss the advantages and disadvantages of each.

**FINDINGS:** Methods that start with genomic DNA include telomere restriction fragment (TRF) length analysis, PCR amplification of telomere repeats relative to a single copy gene by Q-PCR or MMQPCR and single telomere length analysis (STELA), a PCR-based approach that accurately measures the full spectrum of telomere lengths from individual chromosomes. A different set of methods relies on fluorescent in situ hybridization (FISH) to detect telomere repeats in individual cells or chromosomes. By including essential calibration steps and appropriate controls these methods can be used to measure telomere repeat length or content in chromosomes and cells. Such methods include quantitative FISH (Q-FISH) and flow FISH which are based on digital microscopy and flow cytometry, respectively.

**CONCLUSIONS:** Here the basic principles of various telomere length measurement methods are described and their strengths and weaknesses are highlighted. Some recent developments in telomere length analysis are also discussed. The information in this review should facilitate the selection of the most suitable method to address specific research question about telomeres in either model organisms or human subjects.

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