FSHD1 Diagnostics: Single-Molecule Optical Mapping (Pt 1)

Single-molecule optical mapping (SMOM) for FSHD1 D4Z4 deletion testing.

The original genetic testing for FSHD was based on detecting a deletion within the chromosome 4q35 D4Z4 repeat array, and later, assaying for an FSHD permissive allele on the contracted chromosome.

Bionano Genomics has developed mostly automated technology to essentially do the same analysis but using a different technique: single-molecule optical mapping (SMOM) on the Bionano Saphyr System.

This SMOM system simultaneously detects the number of D4Z4 repeat units for all four D4Z4 arrays (2 each on chromosomes 4 and 10) and identifies the associated 4A and 4B alleles.

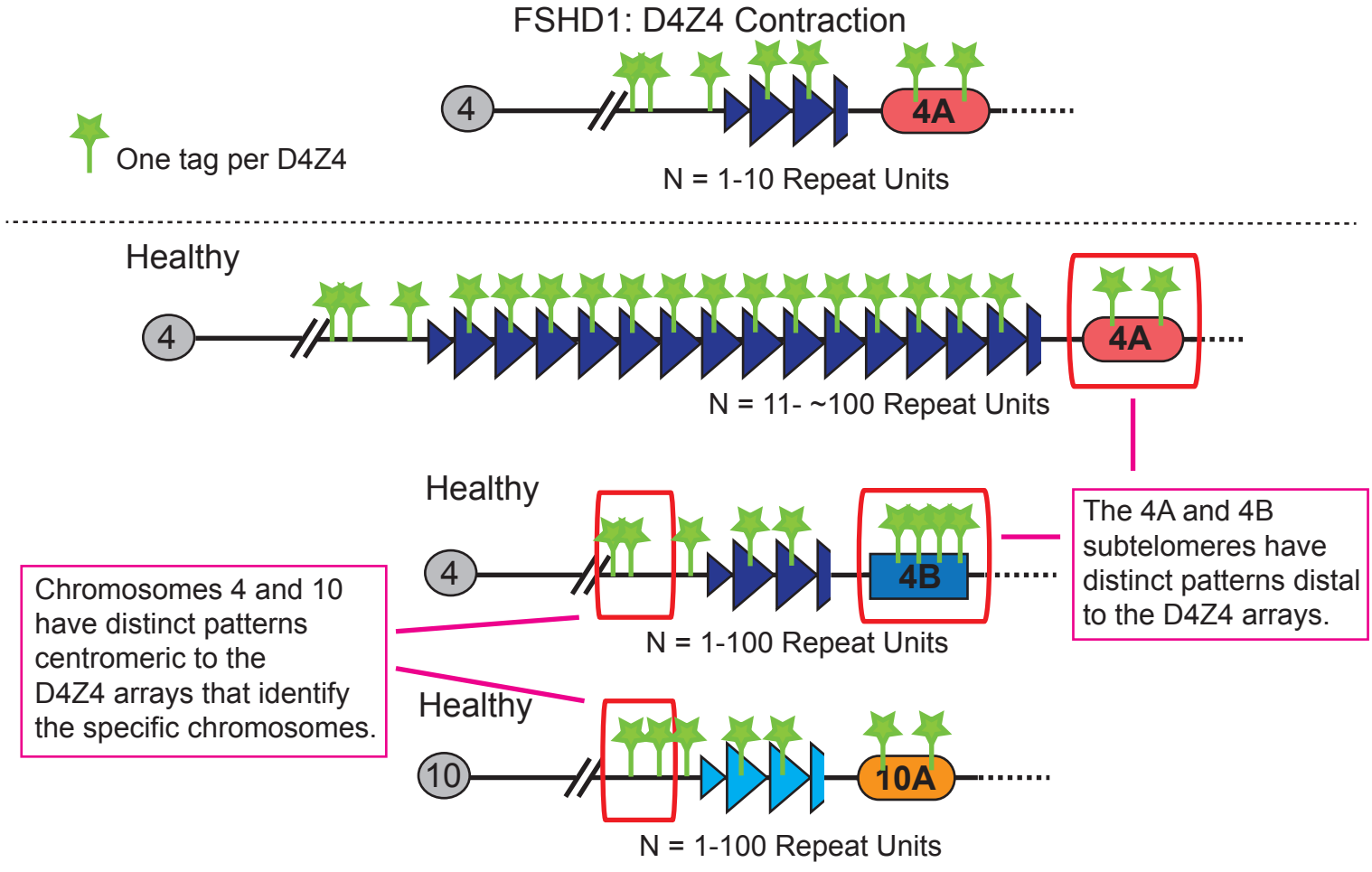
Can detect somatic mosaicism, duplications, and recombination events.

This diagnostic technique is highly accurate and is available as a CLIA-approved test. Genetic diagnosis by this method, when CLIA-approved, will qualify you genetically for consideration in clinical trials.

Dai *et al*. (2019) Single-molecule optical mapping enables quantitative measurement of D4Z4 repeats in facioscapulohumeral muscular dystrophy (FSHD). *Journal of Medical Genetics* 57:109-120.

Zhang *et al*. (2019) Clinical application of single-molecule optical mapping to a multigenerational FSHD1 pedigree. *Molecular Genetics & Genomic Medicine* 7:e565.

https://bionanogenomics.com/



FSHD1 Diagnostics: Single-Molecule Optical Mapping (Pt 2)

Single-molecule optical mapping (SMOM) for FSHD1 D4Z4 deletion testing.

Dai *et al*. (2019) Single-molecule optical mapping enables quantitative measurement of D4Z4 repeats in facioscapulohumeral muscular dystrophy (FSHD). *Journal of Medical Genetics* 57:109-120.

Zhang *et al*. (2019) Clinical application of single-molecule optical mapping to a multigenerational FSHD1 pedigree. *Molecular Genetics & Genomic Medicine* 7:e565.

https://bionanogenomics.com/

Determining the size of your chromosome 4 D4Z4 arrays by SMOM:

Collect ~6ml blood sample, isolate cells and HMW DNA.

▼

Nick the genomic DNA using the sequence-specific nicking endonuclease Nb.BssSI.

▼

Label the DNA nicks with fluorescent nucleotides.

▼

Stain the DNA to visualize the backbone.

▼

Load DNA onto a Saphyr chip and run the Bionano Saphyr instrument.

▼

DNA molecules are linearly analyzed.

▼

Identify the D4Z4 RUs and subtelomeres for each chromosome 4q35 and 10q26 D4Z4 array.

In the USA, available at:
PerkinElmer Genomics
University of Iowa Diagnostics Lab

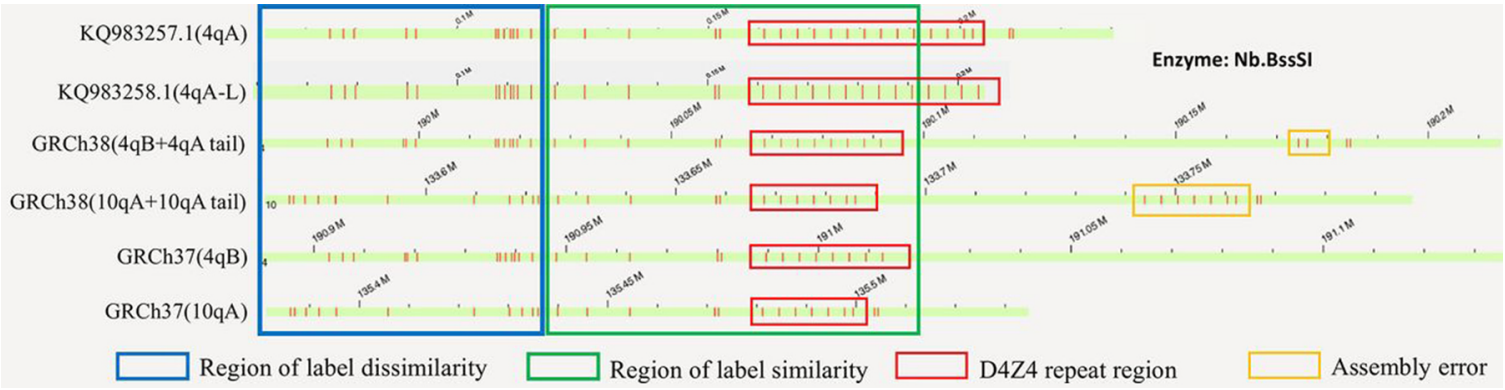


Figure modified from: Q. Zhang *et al*., (2019) *Molecular Genetics & Genomic Medicine* 7:e565.