Formaldehyde-Assisted Isolation of Regulatory Elements - FAIRE

Scientific Relevance

- Nucleosome positioning determines availability of TF binding sites and has significant regulatory functions affecting transcription, DNA repair, replication, and recombination (1).
- Changes in chromatin accessibility accompany biological processes such as cell differentiation (2, 3), environmental signalling (4), and disease development (5, 6).
- FAIRE provides a streamlined method for isolation and identification of functional regulatory elements (7, 8).

Challenges

- Reproducible chromatin shearing with a tight size distribution, is key to allowing efficient isolation of regulatory regions embedded in open chromatin.
- Insufficient chromatin shearing causes high signal-to-noise-ratios and inefficient capture of regulatory elements.

Workflow

Formaldehyde Fixed Chromatin

AFA

Shearing

Phenol Chloroform Extraction

aqueous

organic

Purify DNA from aqueous phase

Reverse X-link

Sequencing

Advantages of Adaptive Focused Acoustics® (AFA®)

AFA technology is a very gentle, reproducible, and tuneable shearing method.

- Tight size distribution ensures comprehensive representation of regulatory regions.
- Random shearing guarantees an unbiased fragmentation and sufficient capture of regulatory elements.
- Reproducible shearing allows reliable comparison of samples from different origins such as cancer subtypes or different stages of progressive diseases.

Suggested Covaris Products

- Covaris Focused-ultrasonicator
  (M-Series, S-Series, E-Series, or LE-Series)

Citations

- Rodriguez-Gil et al., The CCR4-NOT complex contributes to repression of Major Histocompatibility Complex class II transcription. Scientific Reports, (2017).