

# Formaldehyde-Assisted Isolation of Regulatory Elements - FAIRE

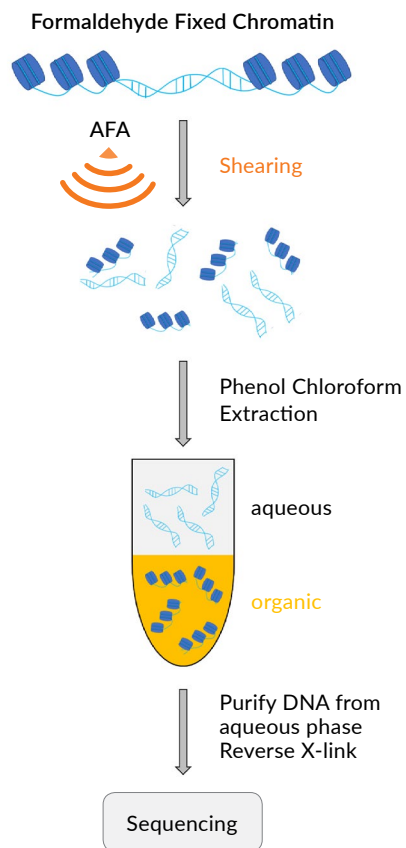
## Scientific Relevance

- 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



**Schematic representation of FAIRE workflow ([7](#), [8](#)).** Crosslinked chromatin is sheared using unbiased and reproducible AFA and subjected to phenol-chloroform extraction. Here DNA that is heavily bound by proteins such as heterochromatic regions migrate to the organic phase while protein-free DNA fragments such as open chromatin embedded regulatory elements reside in the aqueous phase. DNA is purified from the aqueous phase, the cross-link is reversed and the material is sequenced.

## 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, \(2017\)](#)
- [Rodriguez-Gil et al., Formaldehyde-assisted Isolation of Regulatory Elements to Measure Chromatin Accessibility in Mammalian Cells. J Vis Exp., \(2018\)](#)