CROYEZ

dCas9-KRAB CRISPRi

Suppressing Genes Without Cutting DNA

dCas9-KRAB is a widely used tool in CRISPR interference (CRISPRi), designed for transcriptional repression of target genes without causing DNA cleavage. It combines a catalytically inactive dCas9 with the KRAB (Krüppel-associated box) domain, which serves as a strong transcriptional repressor.

dCas9 (Deactivated Cas9)

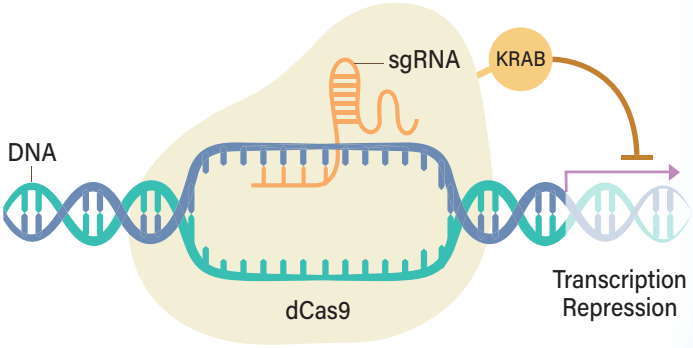
- Derived from CRISPR-Cas9 but carries two point mutations (D10A and H840A) that prevent it from cutting DNA.
- Retains the ability to bind to specific genomic loci via a single guide RNA (sgRNA).

KRAB Repression Domain

- A transcriptional repressor domain that recruits chromatin-modifying proteins such as histone deacetylases (HDACs) and heterochromatin-associated proteins (e.g., HP1).
- Induces heterochromatin formation and histone modifications (such as H3K9 trimethylation), leading to gene silencing.

Transcriptional Repression

- dCas9-KRAB is directed to a target gene's promoter or enhancer region using sgRNA.
- KRAB recruits epigenetic repressors, preventing RNA polymerase II binding and thereby inhibiting gene transcription.



Gene Knockdown

Represses target genes without altering DNA sequence.

Cell Reprogramming

Modulating gene expression in stem cell differentiation.

High-Throughput Screening

CRISPRi libraries can be used for drug target identification.

Epigenetic Studies

Investigates chromatin modifications and gene regulation.

Therapeutic Potential

Used for disease models and potential treatments by silencing disease-related genes.