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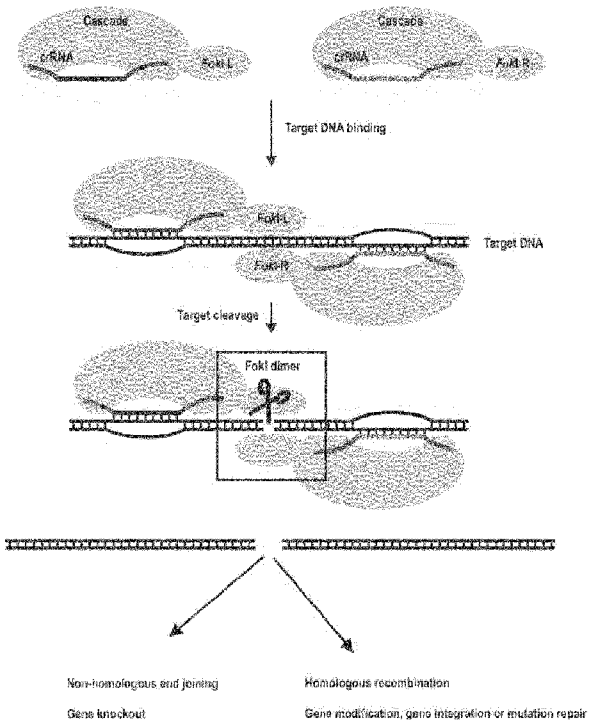
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(54) Title: MODIFIED CASCADE RIBONUCLEOPROTEINS AND USES THEREOF

Figure 7



(57) Abstract: A clustered regularly interspaced short palindromic repeat (CRISPR)-associated complex for adaptive antiviral defence(Cascade);the Cascade protein complex comprising at least CRISPR-associated protein subunits Cas7, Cas5 and Cas6 which includes at least one subunit with an additional amino acid sequence possessing nucleic acid or chromatin modifying, visualising, transcription activating or transcription repressing activity. The Cascade complex with additional activity is combined with an RNA molecule to produce a ribonucleoprotein complex. The RNA molecule is selected to have substantial complementarity to a target sequence. Targeted ribonucleoproteins can be used as genetic engineering tools for precise cutting of nucleic acids in homologous recombination, non-homologous end joining, gene modification, gene integration, mutation repair or for their visualisation, transcriptional activation or repression.A pair of ribonucleotides fused to FokI dimers may be used to generate double-strand breakages in the DNA to facilitate these applications in a sequence-specific manner.

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