遗传 » 2013, Vol. 35 » Issue (4) :395-409 DOI: 10.3724/SP.J.1005.2013.00395

类转录激活因子效应物核酸酶(TALEN)介导的基因组定点修饰技术

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摘要 人工构建的序列特异性核酸内切酶能够识别并切割特定的DNA靶序列, 造成双链断裂, 从而引起基因组结构的定点改变。人工核酸内切酶技术使得研究人员有可能对任意物种的基因组进行定点修饰, 开启了反向遗传学研究的新天地。类转录激活因子效应物核酸酶(Transcription activator-like effector nuclease, TALEN)自2010年底开始成功应用于基因打靶, 很快成为一种比锌指核酸酶(Zinc-finger nuclease, ZFN)更容易设计、特异性更高和毒性更低的人工核酸内切酶。文章综述了TALEN技术的研究进展及应用前景, 重点介绍TALEN的结构、作用机制与构建方法和利用TALEN进行基因组定点修饰的策略, 以及目前利用这一技术已成功实现突变的物种及内源基因, 特别是在斑马鱼中的应用, 为开展这一领域的研究工作提供参考。

关键词: 类转录激活因子效应物(TALE) 类转录激活因子效应物核酸酶(TALEN) 人工核酸内切酶(EEN) 基因组编辑 基因组定点修饰

Abstract: Artificial designer nucleases targeting specific DNA sequences open up a new field for reverse genetics study. The rapid development of engineered endonucleases (EENs) enables targeted genome modification theoretically in any species. The construction of transcription activator-like effector nucleases (TALENs) is simpler with higher specificity and less toxicity than zinc-finger nucleases (ZFNs). Here, we summarized the recent progresses and prospects of TALEN technology, with an emphasis on its structure, function, and construction strategies, as well as a collection of species and genes that have been successfully modified by TALENs, especially the application in zebrafish.

Keywords: transcription activator-like effector (TALE), transcription activator-like effector nuclease (TALEN), engineered endonuclease (EEN), genome editing, targeted genome modification

收稿日期: 2012-11-12; 出版日期: 2013-04-25

基金资助:

国家重大科学研究计划项目(编号：2011CBA01000和2012CB945101)和国家自然科学基金项目(编号：31110103904)资助

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引用本文:
沈延 肖安 黄鹏 王唯晔 朱作言 张博. 类转录激活因子效应物核酸酶(TALEN)介导的基因组定点修饰技术. 遗传, 2013, 35(4): 395-409.

SHEN Yan, XIAO An, HUANG Peng, WANG Wei-Ye, ZHU Zuo-Yan, ZHANG Bo. TALE nuclease engineering and targeted genome modification. HEREDITAS, 2013,V35(4): 395-409.

链接本文:

http://www.chinagene.cn/Jwk_yc/CN/10.3724/SP.J.1005.2013.00395 或 http://www.chinagene.cn/Jwk_yc/CN/Y2013/V35/I4/395

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