Docket #: S12-177

SHAPE reagents — probes for in vivo and in vitro analysis of RNA structure

Researchers in the laboratories of Dr. Eric Kool and Dr. Howard Chang have created and characterized chemical probes that enable accurate RNA structural analysis in living cells. RNA structure plays an important role in practically every facet of gene regulation. RNA structure in cells is influenced by a variety of factors including the rate of transcription, binding of small molecules and interactions with numerous RNA binding proteins. As such RNA structure *in vivo* is likely to be more complex and fundamentally different than what is observed *in vitro* and thus it is crucial to understand RNA structure *in vivo*. However, the lack of structural probes that function *in vivo* has limited such efforts. This technology overcomes this limitation as the novel chemical probes can be used for RNA structural analysis *in vitro* and *in vivo*.

Applications

- Obtain RNA structural data *in vitro* or *in vivo*
- Assess dynamic changes in RNA structure in different cell states or in cells knocked out for any gene
- Reversibly modify RNA *in vitro* or *in vivo*
- Compare *in vitro* and *in vivo* RNA structural data
- Diagnose cancers where RNA structure plays a role, e.g. by probing HOTAIR RNA which is highly expressed in metastatic breast cancers

Advantages

- Accurately measure RNA structure *in vivo*
- Useful in a wide range of organisms: mammalian cells, yeast, bacteria
- Soluble

- Stable
- Sensitive- single nucleotide resolution
- Selectively reactive

Publications

- Robert C. Spitale, Ryan A. Flynn, Qiangfeng Cliff Zhang, Pete Crisalli, Byron Lee, Jong-Wha Jung, Hannes Y. Kuchelmeister, Pedro J. Batista, Eduardo A. Torre, Eric T. Kool, Howard Y. Chang. Structural imprints in vivo decode RNA regulatory mechanisms. Nature. 2015-3-25.
- Robert C. Spitale, Ryan A. Flynn, Eduardo A. Torre, Eric T. Kool and Howard Y. Chang, RNA structural analysis by evolving SHAPE chemistry, Wiley Interdiscip Rev RNA, 2014, 5, 867-881.
- Robert Spitale, Pete Crisalli, Ryan Flynn, Eduardo Torre, Eric Kool, Howard Chang. RNA SHAPE analysis in living cells. Nature Chemical Biology. 2012-11-25.

Patents

- Published Application: 20140154673
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