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Non-enzymatic Synthesis of RNA and Nucleic Acid-like Polymers

Tech ID: 21861 / UC Case 2007-028-0

BACKGROUND

The transfer of DNA sequence information by nucleic acid replication is central to all of biology. This reaction has been incorporated into important biotechnology applications such as the polymerase chain reaction (PCR), an instrumental tool with a variety of important uses such as genetic mutation detection. All such replication reactions are catalyzed by complex enzymatic systems, but new ways to synthesize nucleic acids are needed. The potential use of a non-enzymatic process has been studied, but has been met with limited success.

In earlier studies, it has been demonstrated that anhydrous lipids form a lamellar matrix that can organize monomers within lipid membranes.. Rajamini et al. (2008) reported that drying and rehydrating these membranes at moderately elevated temperatures provides sufficient chemical potential to drive the synthesis of phosphodiester bonds between nucleoside monophosphates resulting in low yields of RNA-like polymers. These strands were around 50 nucleotides in length and ranged from 10 to 100 nucleotides.

TECHNOLOGY DESCRIPTION

If random nucleic acid polymers can be synthesized by simple condensation reactions within a fluid lipid matrix it is feasible that an existing nucleic acid polymer can be replicated under the same conditions. UC Santa Cruz researchers have showed that single stranded DNA molecules present in a deoxynucleoside monophosphates and lipid mixture can act as templates to create complementary RNA-like products. Although yields are low compared to enzyme-catalyzed reactions, and error rates are high, it is believed that the appropriate modifications of the protocol will provide much more improved results.

APPLICATIONS

- ▶ Non-enzymatic alternative to enzymatic replication of nucleic acids

ADVANTAGES

- ▶ Replicates significantly faster than an enzymatic reaction
- ▶ More precise than an enzymatic reaction

INTELLECTUAL PROPERTY INFORMATION

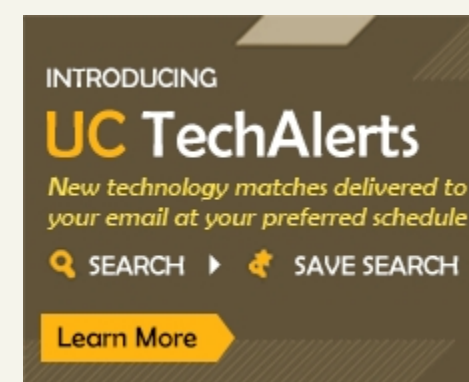
Country	Type	Number	Dated	Case
United States Of America	Issued Patent	7,772,390	08/10/2010	2007-028

RELATED MATERIALS

- ▶ Journal Publication: Non-enzymatic transfer of sequence information under plausible prebiotic conditions. - 12/03/2010
- ▶ Journal Publication: Lipid-assisted synthesis of RNA-like polymers from mononucleotides. - 11/16/2007
- ▶ Science: A nonenzymatic RNA polymerase model. - 02/18/1983

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OTHER INFORMATION

KEYWORDS

Nucleic acid, RNA, DNA, nucleic acid synthesis, biotechnology, polymerase chain reaction, PCR, non-enzymatic replication, enzymatic replication, RNA polymerase

CATEGORIZED AS

- ▶ **Biotechnology**
 - ▶ Bioinformatics
 - ▶ Genomics
- ▶ **Research Tools**
 - ▶ Nucleic Acids/DNA/RNA

RELATED CASES

2007-028-0

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

▶ [METHODS AND DEVICES FOR NON-ENZYMATIC NUCLEIC ACID SYNTHESIS](#)

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