

OFFICE OF TECHNOLOGY TRANSFER

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TECHNOLOGY OPPORTUNITY

Light-directed, *in situ* synthesis of RNA microarrays

McGill University is seeking a company interested in commercializing compositions and methods for maskless, light-directed *in situ* synthesis of RNA microarrays on solid substrates. The recent discovery of double-stranded RNAs as gene knockdown agents and their potential therapeutic applications has led to a resurgence in RNA synthesis and spurred the demand for new methods tailored to the fabrication of RNA microarrays. In 2004 the total array market, including DNA, protein and tissue arrays, was valued at $1.1 B and is expected to reach $4.7B by 2015 with a growth rate of over 22%. In 2009, the DNA array market alone was valued at $1.8B. RNA arrays have been described but they are not widely available and this market has not been valued. This is probably due to the fact that current strategies involve handling and immobilization of a pre-synthesized RNA on a microarray, limiting the complexity and versatility of the microarray, and exposing the RNA to nuclease degradation Our technology overcomes these limitations and allows growth of the RNA directly on the chip surface.

Applications

RNA microarrays to study ligand , peptide-RNA or protein-RNA interactions and RNA/RNA or RNA/DNA duplexes binding parameters.

Advantages

•2'-*O*-ALE chemistry allows efficient synthesis of RNAs that retain their activity.

•*In situ* synthesis overcomes limitations of currently used "spotted" array construction method.

•Maskless photolithographic microarray technology yields high complexity RNA chips on glass substrate similar to DNA chips. Arrays have at least 500,000 oligoribonucleotide probes per 1 cm^2 and provide quantitative information.

•Protection strategy prevents common isomerization problems and deprotection can be performed on solid support without oligomer degradation.

Technology

The present invention features the synthesis and use of novel RNA monomers such as 5'-NPPOC-2'-ALE-3'-phosphoramidite derivatives for the synthesis of RNA oligonucleotide probes and for *in situ* RNA microarray fabrication for molecular interactions analysis. The utility of these novel RNA monomers can be extended to routine synthesis of RNA on conventional solid supports such as controlled pore glass and polystyrene and allows deprotection of the base protecting moieties and 2' protecting groups without nonselective cleavage of the oligoribonucleotides from the support. The ALE 2'-protecting group strategy provides two distinct advantages: (1) it prevents the common 2' to 3'- isomerization that can occur with other protecting groups, and (2) the removal of all protecting groups can be efficiently performed on the solid support, which simplifies post-synthesis deprotection of RNA chains and minimizes the potential for degradation of the oligomers by RNases. The arrays can be used with single-stranded, double-stranded, or otherwise structured RNA molecules as controlled and defined by the researcher.

The Inventors

Dr. Masad J. Damha is James McGill Professor in the Department of Chemistry of McGill University. He obtained his PhD in Chemistry from McGill University in 1988. Dr. Damha's research is focused on nucleic acid chemistry. He has been studying DNA mimics as model systems for down-regulating gene expression. The arabinose-based compounds his research group has developed entered human clinical trials in 2007 for the management of chronic obstructive pulmonary disease.

Dr. Franco Cerrina is currently Professor and Chairman of the Electrical and Computer Engineering Department at Boston University. He obtained his doctorate in physics from the University of Rome in 1974. Dr Cerrina became director of the Center for Nanotechnology and Lynn H. Matthias Professor in Engineering at the University of Wisconsin–Madison. His research centers on semiconductor fabrication, optics and advanced lithography, including DNA microarray fabrication techniques. He is a cofounder of Roche-NimbleGen, a custom microarray company.

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Opportunity: Exclusive license and/or research collaboration

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