

A Novel Circular RNA-based Therapeutical Platform for Infectious and Non-Infectious Diseases

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Proper folding of RNA molecules is critical for their regulation and functionality. Consequently, alterations in this process can lead to genetic diseases such as ALS or Steinert Syndrome, the most common form of muscular dystrophy, where aberrant secondary structures impair splicing. Additionally, viral RNA transcripts often contain highly conserved RNA structures that play crucial roles in virus expansion. Thus, secondary RNA structures within cellular mRNAs and viral RNA transcripts present untapped potential as therapeutic targets for a wide range of infectious and non-infectious diseases. At noctuRNA Therapeutics, we have developed an innovative circular RNA (circRNA)-based strategy that effectively targets such RNA structures, opening new possibilities for therapeutic interventions. As a proof-of concept we have demonstrated the effectivity in cell culture of circRNAs design to correct Steinert-related aberrant RNA structures, repairing splicing defects, or to inhibit multiple viral infections, including those caused by hepatitis C virus, dengue virus, west Nile virus, and SARS-CoV-2.

Key advantages of noctuRNA circRNAs include (i) exceptional stability in vivo, without the need of chemical modifications, that ensures a sustain therapeutic effects, (ii) versatility to specifically target a single RNA structure or to generate circRNAs with broad-spectrum activities by including within one circRNA molecule sequences that hybridize to different targets, and (iii) in case of viral infections, ultrafast response to novel virus threats, as we can generate highly efficient antiviral circRNAs within 4 weeks after viral sequence information become available, and hampering of resistance, as secondary structures are highly conserved in viral RNAs. In conclusion, our circRNA-based therapeutic platform holds promise in addressing a wide range of infectious and non-infectious diseases pushing the boundaries of RNA-based therapeutics to bring significant advancements in the field of medicine.