ARCTURUS THERAPEUTICS

LUNAR®: Enabling mRNA Therapeutics and Vaccines

November 2018

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FORWARD LOOKING STATEMENTS

This presentation contains forward-looking statements. These statements relate to future events and involve known and unknown risks, uncertainties and other factors which may cause our actual results, performance or achievements to be materially different from any future performances or achievements expressed or implied by the forward-looking statements. Each of these statements is based only on current information, assumptions and expectations that are inherently subject to change and involve a number of risks and uncertainties. Forward-looking statements include, but are not limited to, statements about: expectations regarding our capitalization and resources; the adequacy of our capital to support our future operations and our ability to successfully initiate and complete clinical trials; our strategy and focus; the development and commercial potential of any of our product candidates; and the entry into or modification or termination of collaborative agreements.

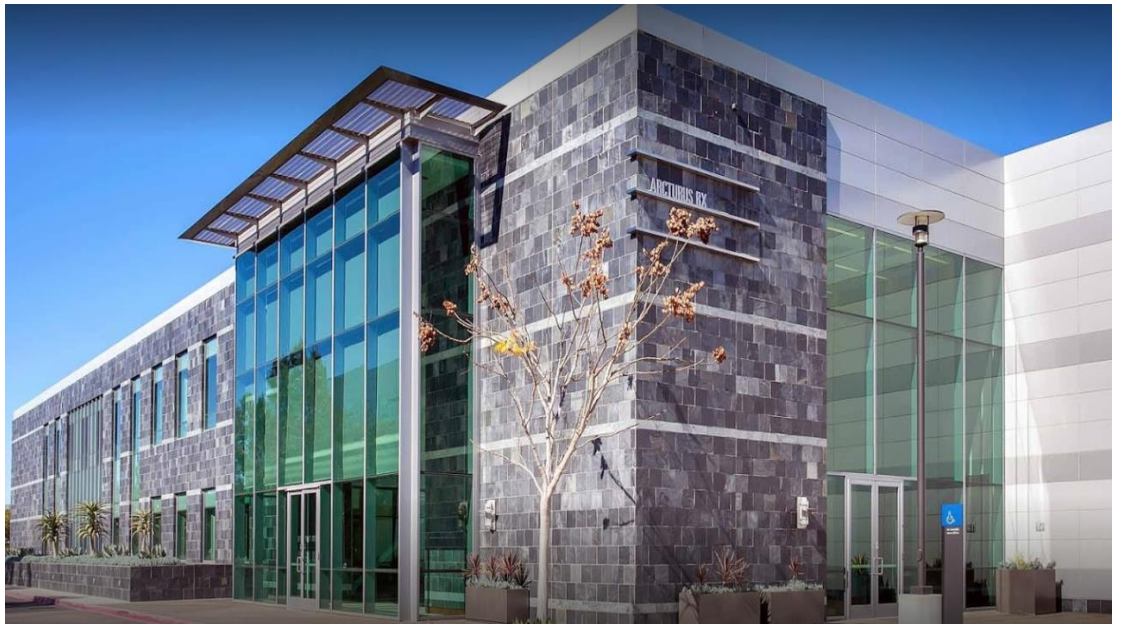
In some cases, you can identify forward-looking statements by terms such as “may,” “will,” “should,” “could,” “would,” “expects,” “plans,” “anticipates,” “believes,” “estimates,” “projects,” “predicts,” “potential” and similar expressions (including the negative thereof) intended to identify forward looking statements. Given the risks and uncertainties, you should not place undue reliance on forward-looking statements. The forward-looking statements contained or implied in this press presentation are subject to other risks and uncertainties, including those discussed under the heading "Risk Factors" in our Annual Report on Form 20-F for the fiscal year ended December 31, 2016, filed with the Securities and Exchange Commission (SEC) and in subsequent filings with the SEC. Except as otherwise required by law, we disclaim any intention or obligation to update or revise any forward-looking statements, which speak only as of the date they were made, whether as a result of new information, future events or circumstances or otherwise.

BUILDING INNOVATIVE
RNA MEDICINES

Corporate Overview

RNA medicines company focused on significant opportunities in rare, liver, and respiratory diseases

- HQ: **San Diego, CA**
- Founded: **2013**
- Nasdaq: **ARCT**
- Outstanding shares: **10.7 M**
- Employees: **80**



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Pipeline of RNA Medicines

BUILDING INNOVATIVE RNA MEDICINES

Name	RNA Modality	Indication	Partner	Partnership Structure	IND Date	Route of Administration	Target Organ	Target Cells	Prevalence Worldwide
LUNAR-OTC	mRNA	Ornithine Transcarbamylase Deficiency (OTC)	UREVAC	Co-Dev (50/50)	H2 2019	IV	Liver	Hepatocytes	> 10,000
LUNAR-CF	mRNA	Cystic Fibrosis	CYSTIC FIBROSIS FOUNDATION	Wholly-Owned	H1 2020	Nebulized Aerosol to Lung	Lung	Bronchial Epithelial Cells	> 70,000
LUNAR-HBV	RNA	Hepatitis B	Johnson & Johnson	Collaboration	Undisclosed	IV	Liver	Hepatocytes	275 M
LUNAR-NASH	siRNA	NASH	Takeda	Collaboration	Undisclosed	IV	Liver	Stellate Cells	50 M
LUNAR-GSD3	mRNA	Glycogen Storage Disease type III	ultragenyx	Collaboration	Undisclosed	IV	Liver	Hepatocytes	10,000
LUNAR-RARE	mRNA	Rare Disease	ultragenyx	Collaboration	Undisclosed	IV	Undisclosed	Undisclosed	Undisclosed
LUNAR-RPL	Replicon RNA	Vaccines	SYNTHETIC GENOMICS	Collaboration	Undisclosed	IM	Muscle	Myocytes	Undisclosed

- **Four RNA Medicine Modalities – mRNA, gene editing RNA, siRNA, replicon RNA**
- **Three Routes of Administration – IV, IM, Aerosol**
- **Four Cell Types Targeted – Hepatocytes, Liver Stellate Cells, Bronchial Epithelial Cells, Myocytes**

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BUILDING INNOVATIVE
RNA MEDICINES

LUNAR® Lipid-Mediated Delivery

Versatile

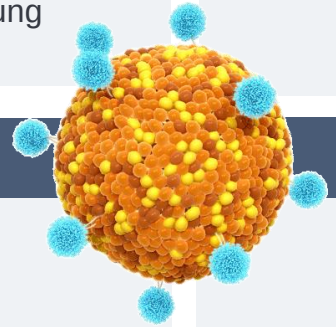
Feature	Benefit
Compatibility	Formulated with multiple RNA modalities
Route of Administration	IV, IM, Nebulization
Cell Type	Hepatocytes, Stellate cells, Myocytes & Lung Epithelial cells

Diverse

Exclusive Library of over 150 Proprietary Lipids

Rational Design to Maximize Efficacy and Increase Tolerability

Formulation Compositions Customized for Application and Cell Type of Interest



Biodegradable

No Accumulation of Lipids

Manufacturing Efficiency

Scalable and Reproducible Production Process

Arcturus LUNAR® = Next Generation of RNA Medicines

LUNAR® Platform: Rational Design and SAR Drives Next Generation

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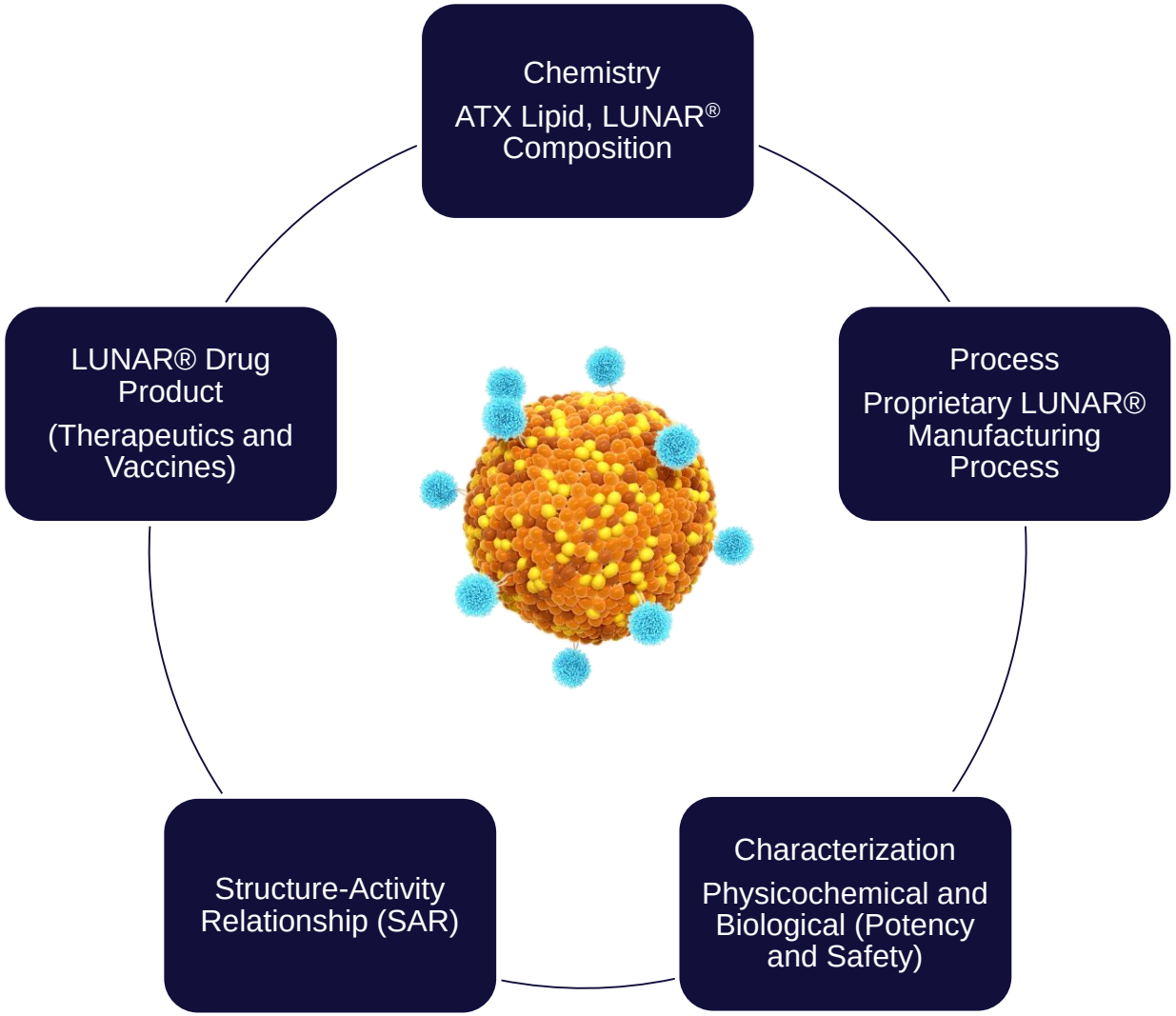

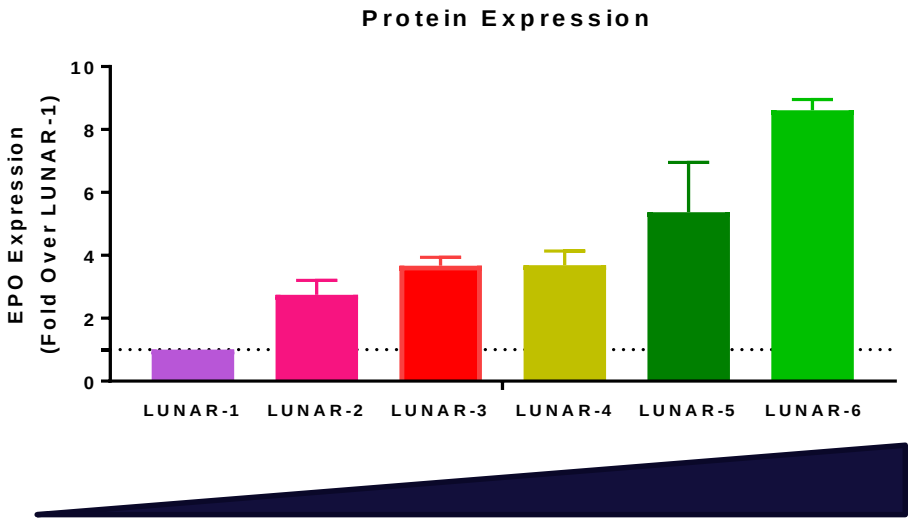

LUNAR®:Functional RNA Delivery to Various Cell Types

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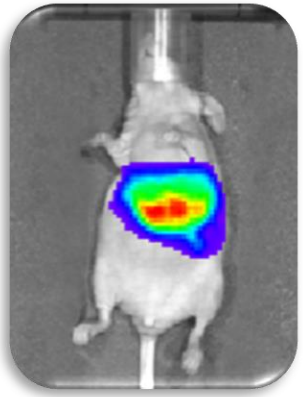
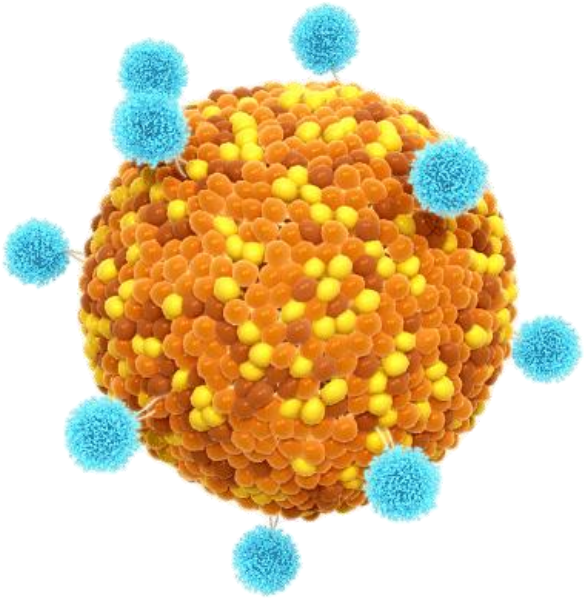
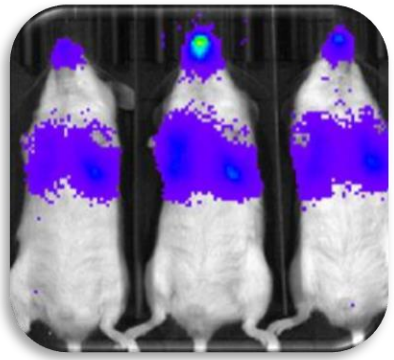
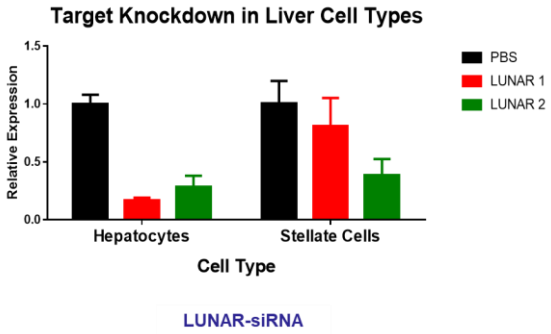
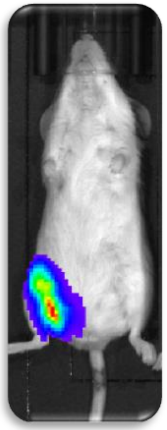




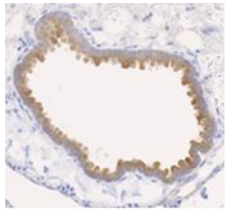




Liver: Hepatocytes, Stellate Cells



Muscle



Bronchial Epithelial Cells

LUNAR® Drug Product: Proprietary, Scalable and Reproducible Process

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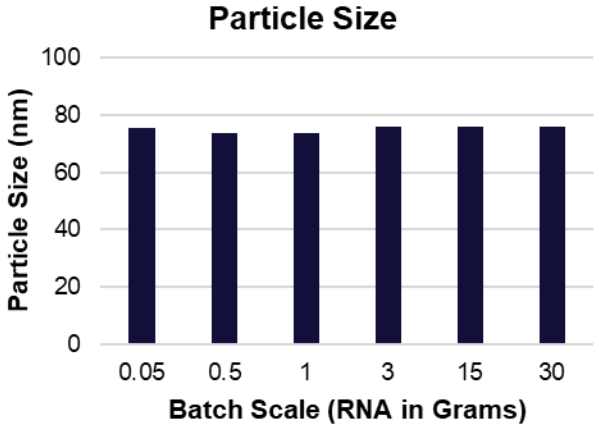
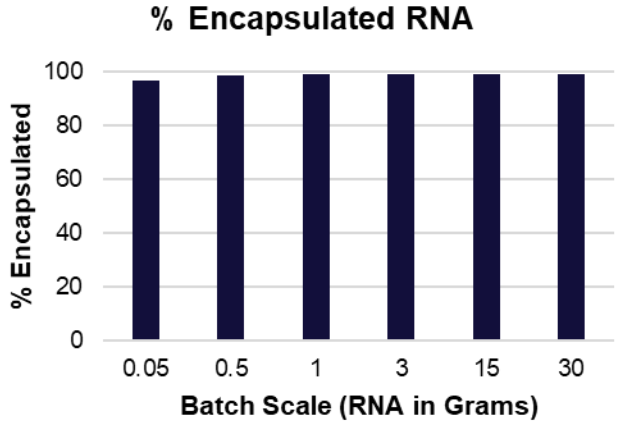
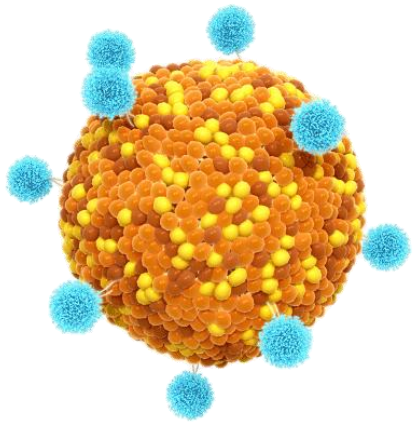
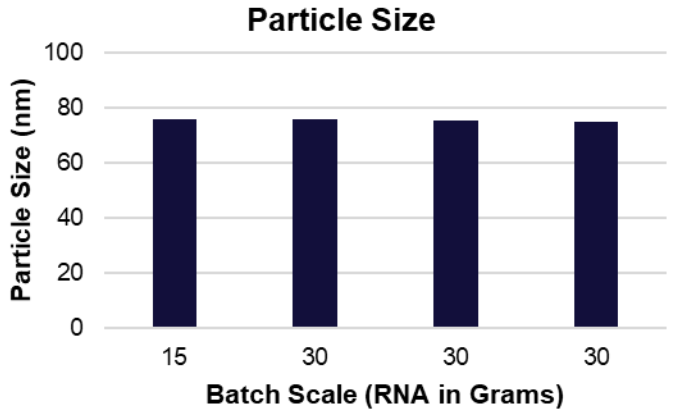
Scalability

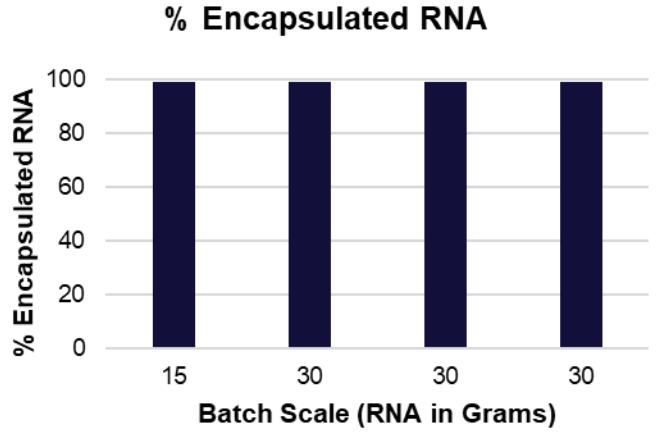






Reproducibility

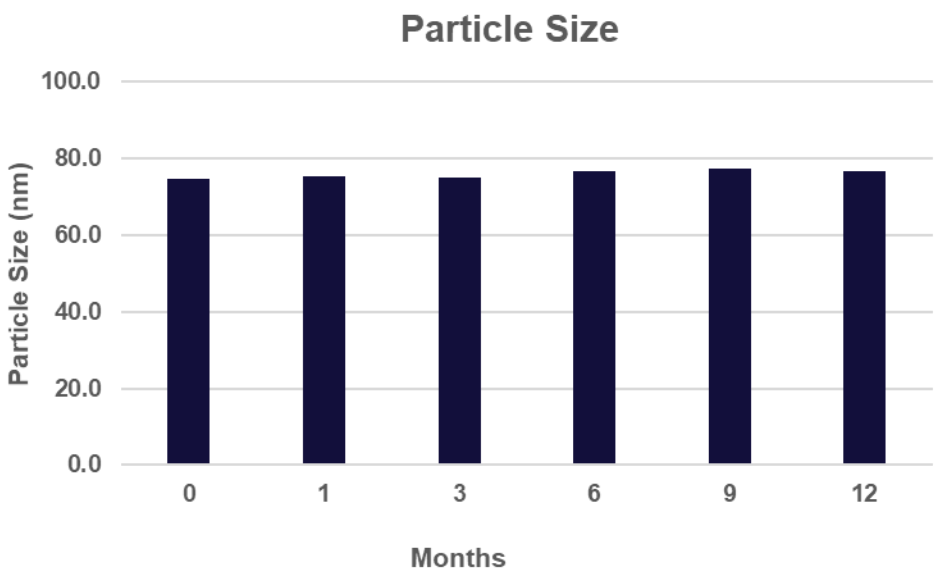


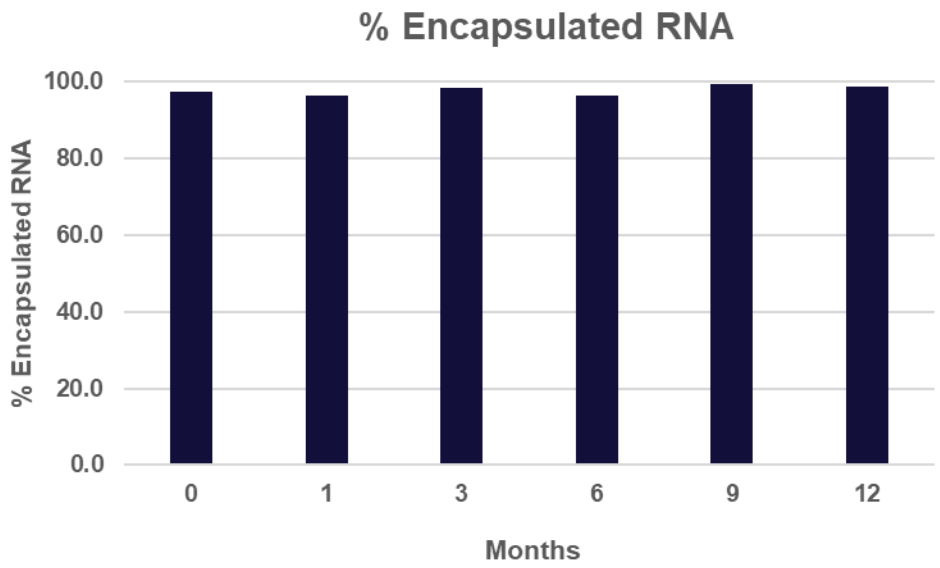


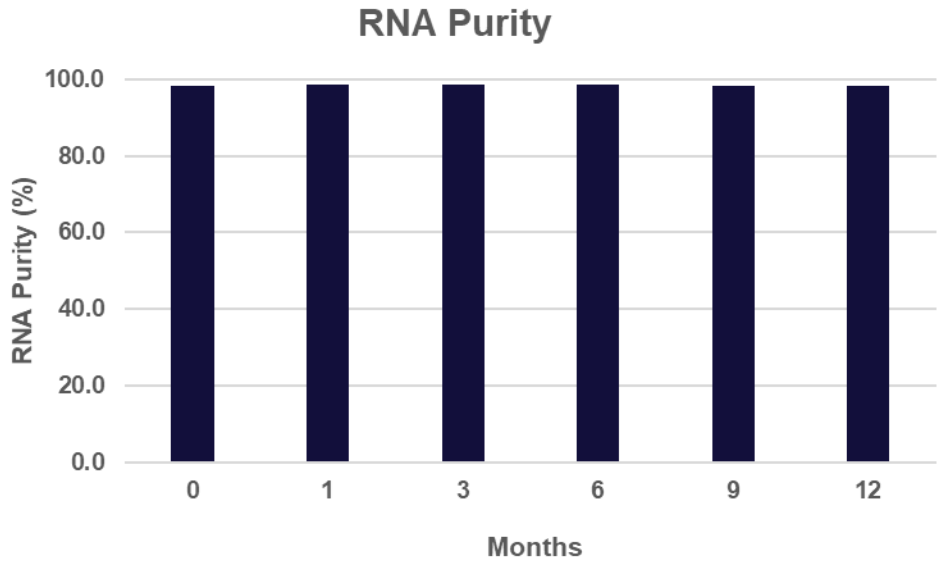
LUNAR® Proprietary Manufacturing Process Demonstrates Scalability and Reproducibility From Milligrams to Multigram Scales Generating Quality Drug Product

LUNAR® Demonstrates Robust Frozen Stability

BUILDING INNOVATIVE RNA MEDICINES







LUNAR®:Compatible Across RNA Platforms

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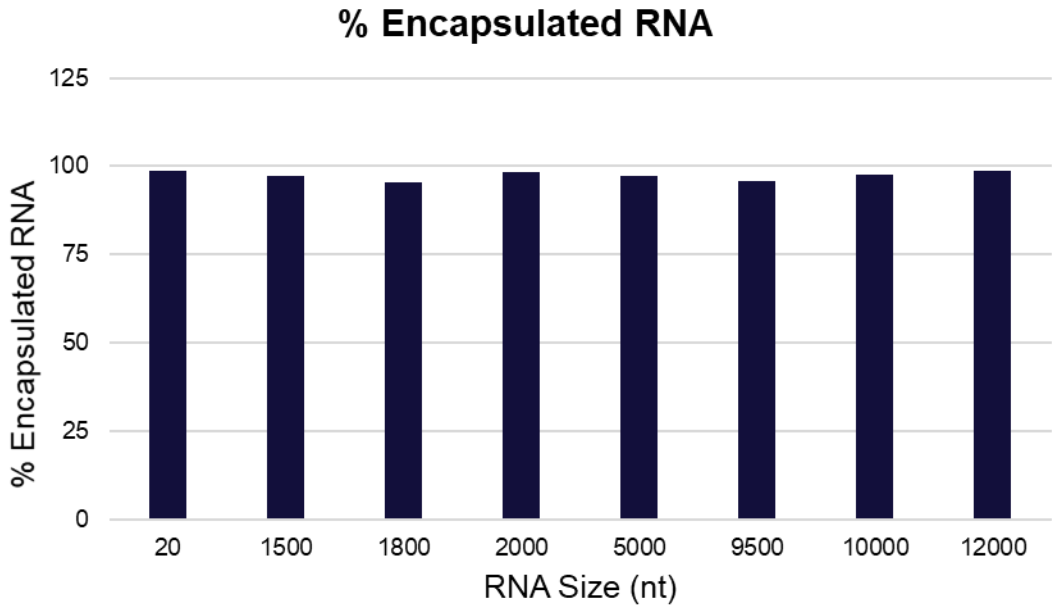

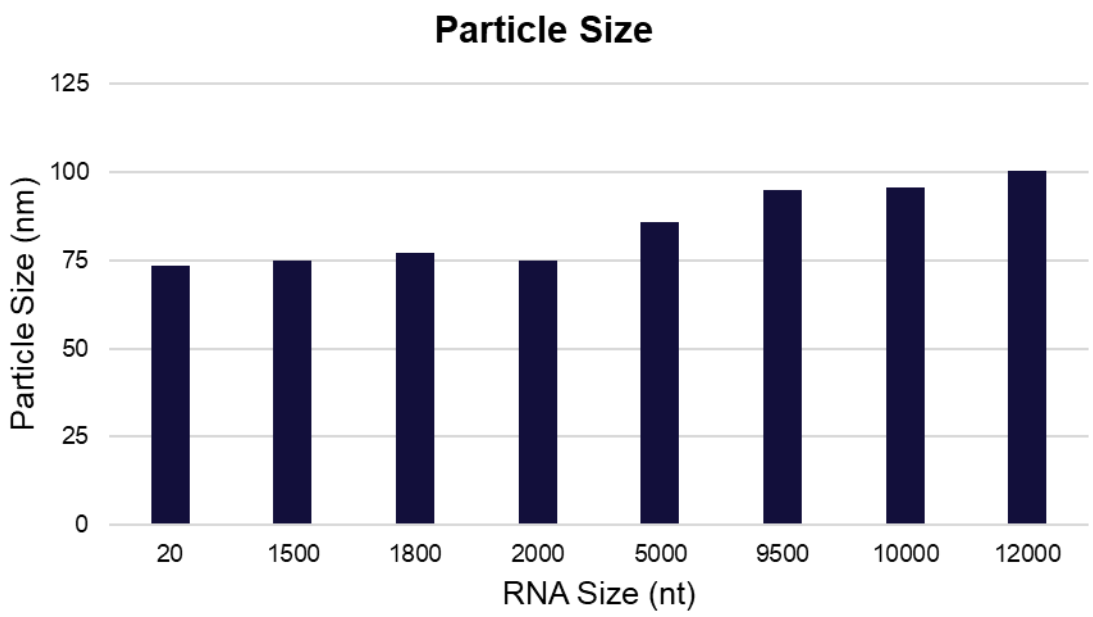

LUNAR Nanoparticles are designed to effectively encapsulate and deliver small to large RNAs

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mRNA structure and optimization

- Nucleotide Optimization
  - Nucleotide chemical optimization is gene dependent
- 5' UTR Optimization 3' UTR Optimization
  - Arcturus has proprietary UTR library used to optimize protein expression and mRNA stability
- 5' CAP structure
  - Arcturus has optimized capping scheme
- Poly-A structure
  - Arcturus has identified optimal poly A tail length
- Codon Optimization
  - Arcturus has proprietary codon optimization algorithms for the open reading frame (ORF)

Arcturus mRNA Manufacturing

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DNA Template Production → IVT and Capping Reaction → Purification Process → Buffer Exchange & Concentration

Features	Benefits
Optimized IVT Method	Reduced Cost; Higher Purity
Improved Capping Reaction	Reduced Cost of Goods
Proprietary Purification Process	Higher Purity in a Shorter Time
Efficient	Entire Process Less Than One Week
Scalable to > 1Kg	Access Large Patient Populations
Adaptable	Can Utilize a Variety of Modifications

Arcturus' Internal mRNA Production: Up to 30 g in Less Than One Week

LUNAR® Delivery of mRNA from Mouse to NHPs

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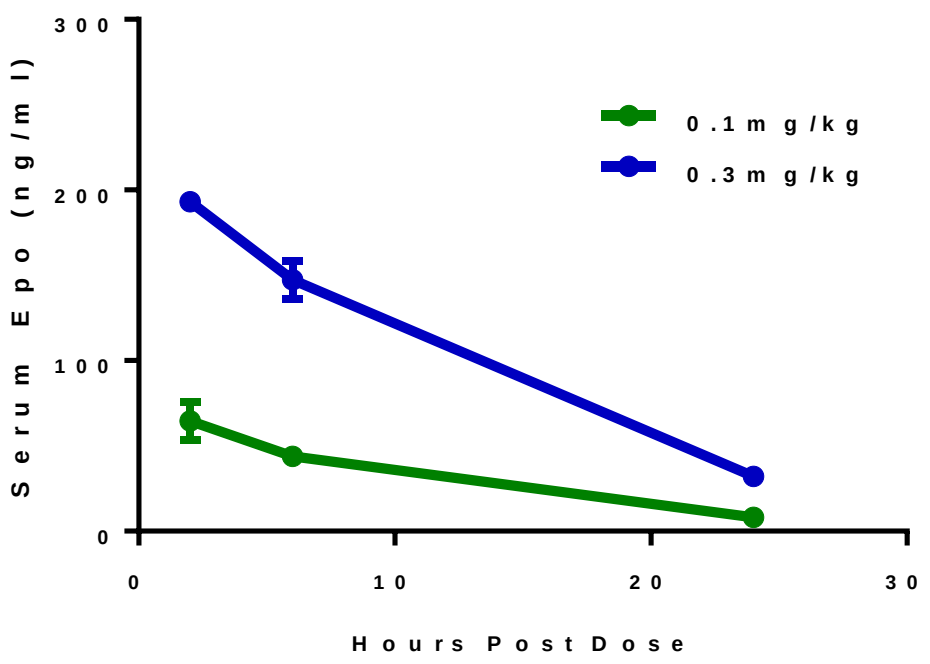
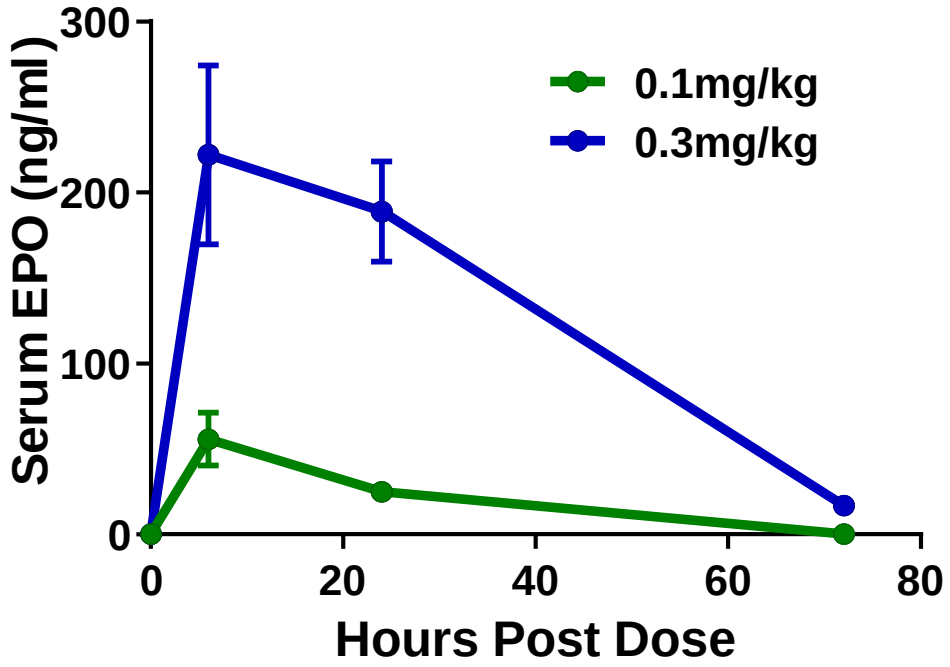
Epo Expression in Rodents



Epo Expression in Primates



LUNAR Demonstrates Functional Delivery of mRNA encoding epo (a secreted protein) to Mouse and NHP Liver

LUNAR Enabled Epo Protein Expression Sustained Upon Repeat Dosing in NHPs

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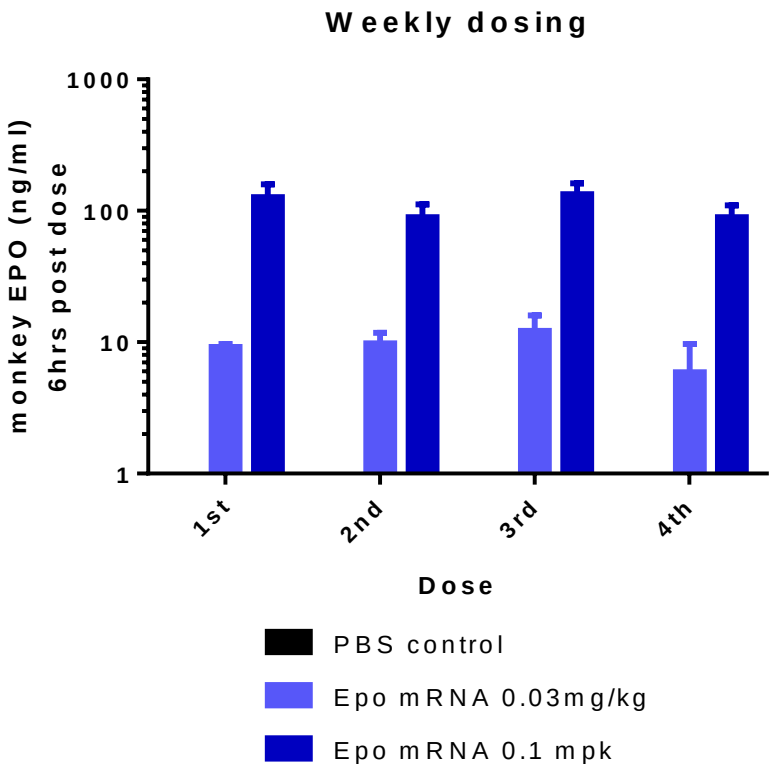

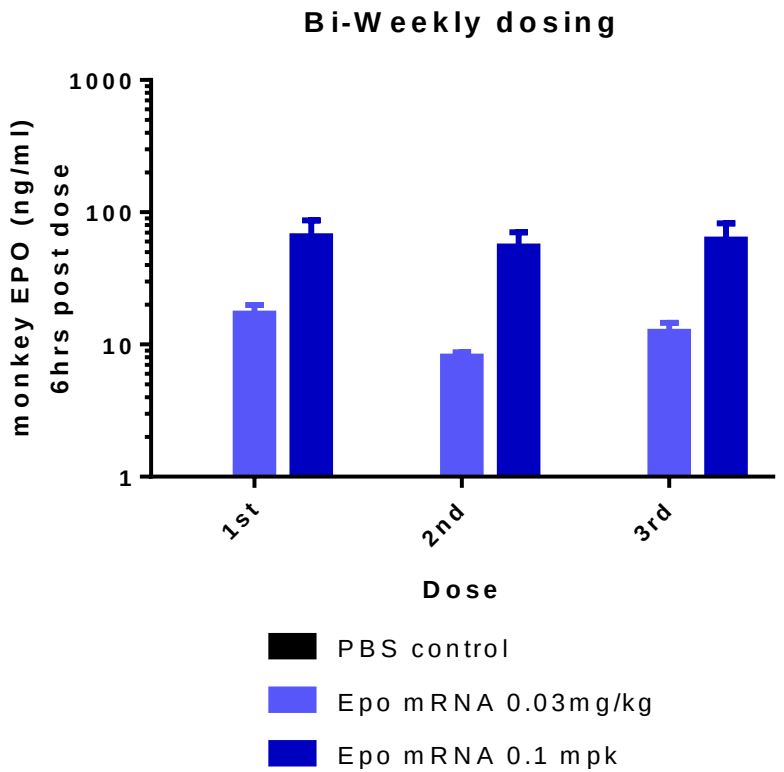

LUNAR® Delivery of mRNA encoding Intracellular Protein to NHP Liver

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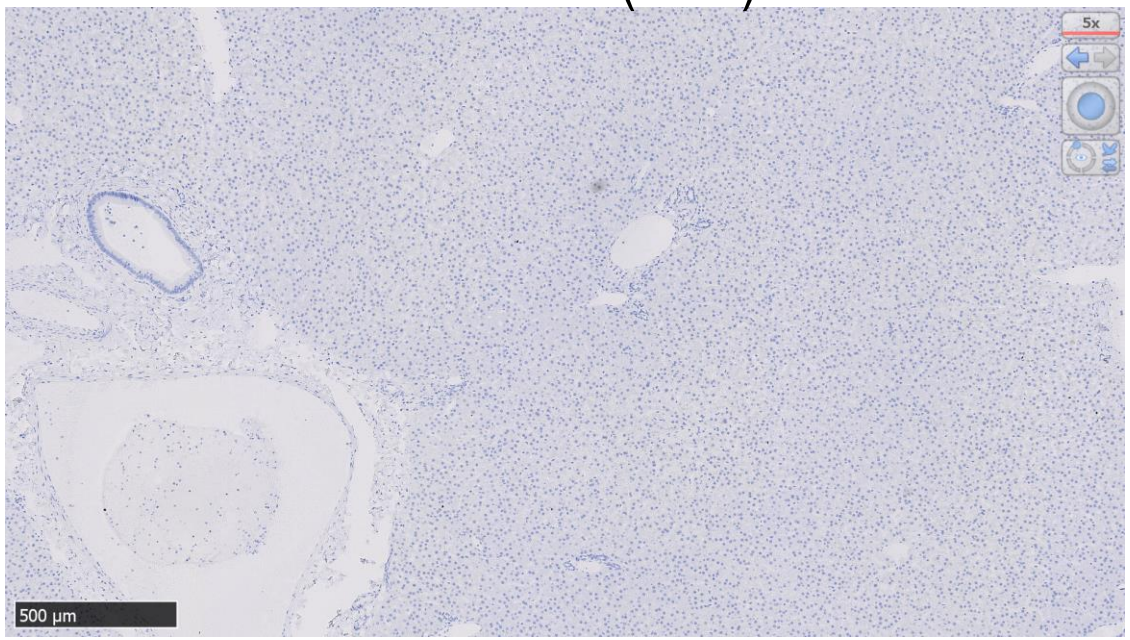
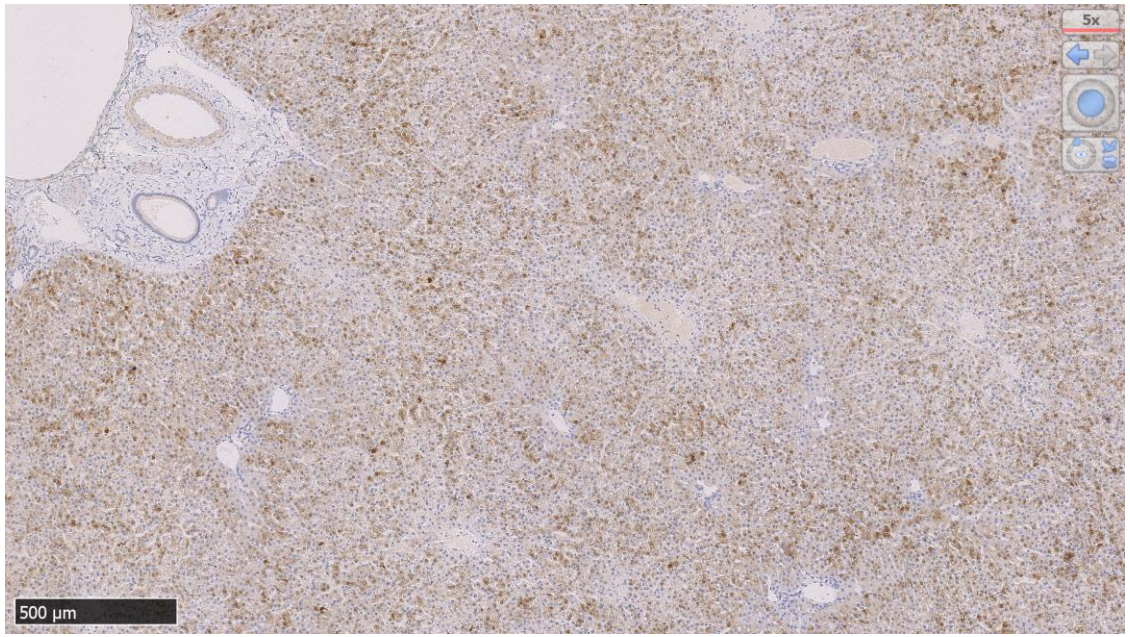
Control (PBS)



LUNAR-RFP



LUNAR Demonstrates Functional Delivery of mRNA encoding RFP (Red Fluorescent Protein) to NHP Liver

OTC Deficiency

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OTC Deficiency Market Opportunity

Ornithine Transcarbamylase (OTC) Deficiency: The most common urea cycle disorder

- The urea cycle converts neurotoxic ammonia to water-soluble urea that can be excreted in urine
- Deficiency in OTC causes elevated blood ammonia, which can lead to neurological damage, coma, and death
- 10,000 worldwide prevalence

Unmet Medical Need

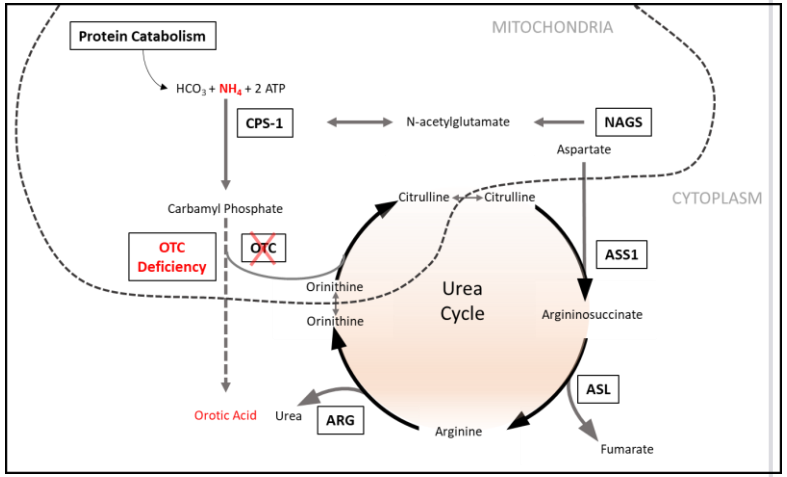
- Present standard of care involves a strict diet (low protein, high fluid intake)
- plus ammonia scavengers (RAVICTI®)
- Present standard of care does not effectively prevent spikes of ammonia.

Neonatal Onset: Highest Unmet Need

- Severe metabolic crisis, often fatal
- Usually referred for liver transplant

Late Onset: Children to Adults

- Susceptible to hyperammonemic crisis
- Repeated crisis require liver transplant



LUNAR-OTC Aims to Restore Enzyme Function

- Expression of OTC enzyme in liver has potential to restore normal urea cycle activity to detoxify ammonia, preventing neurological damage and removing need for liver transplantation

IN VIVO AND IN VITRO EFFICACY

Activity of OTC mRNA

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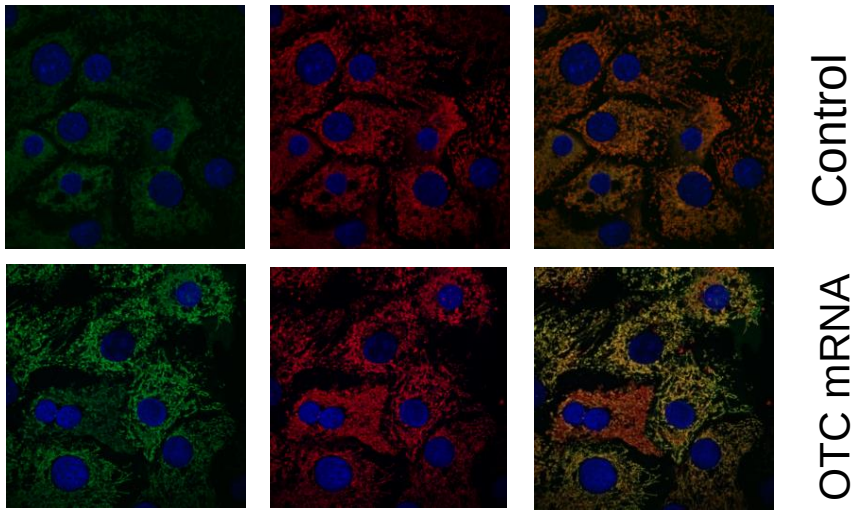
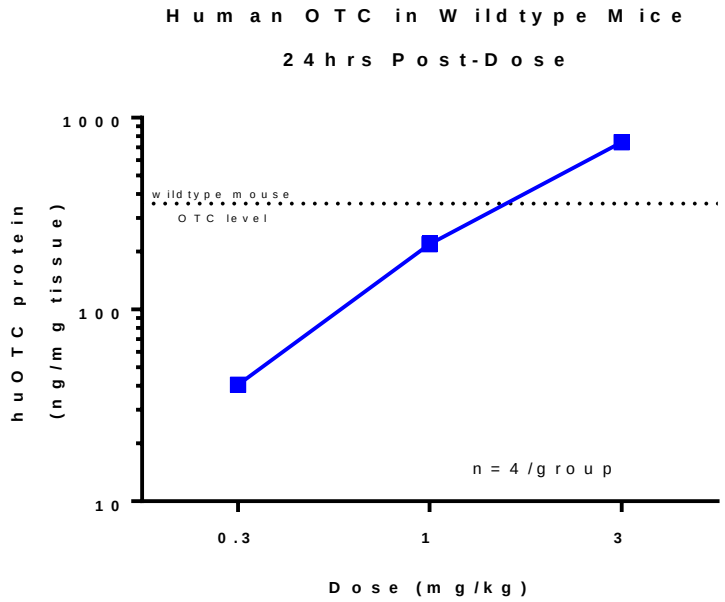
OTC Protein Localizes to Mitochondria in Transfected Primary Human Hepatocytes



OTC Protein Expression in Mouse Liver after LUNAR-OTC Treatment



Ornithine Transcarbamylase Expression in OTC spf-ash Mice

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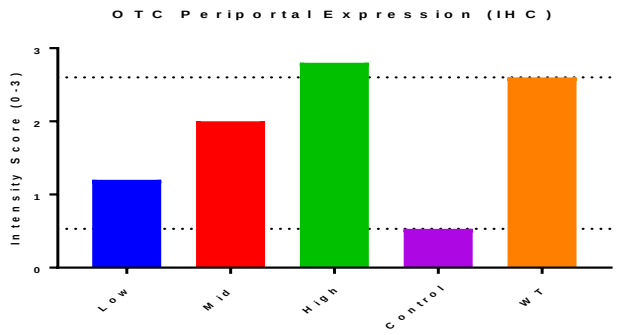
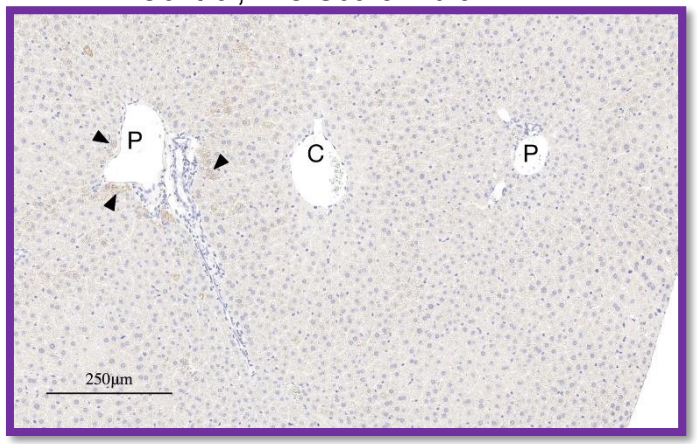


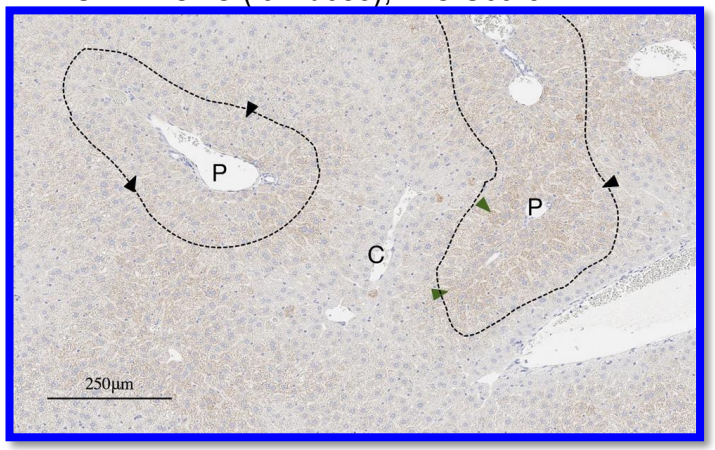
Control, IHC Score = 0.5



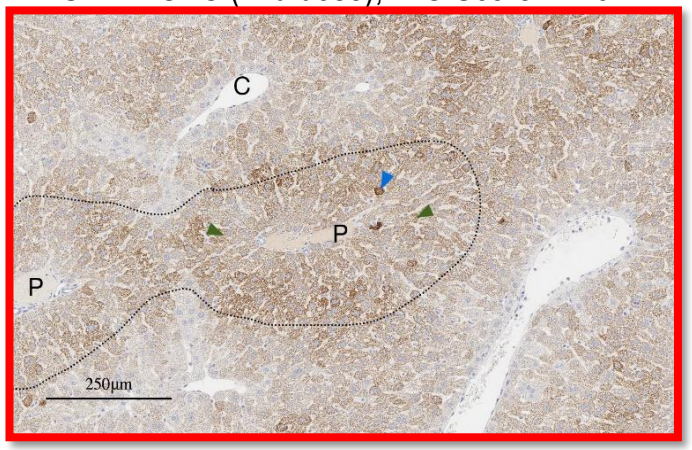
METHODS

- Slides were evaluated by a board-certified veterinary pathologist using light microscopy.
- OTC immunolabeling in portal hepatocytes was scored 0-3, where 0=immunolabeling absent; 1=weak immunolabeling; 2=moderate immunolabeling; 3=intense immunolabeling.
- An intensity score was recorded for fifteen random portal areas (five per tissue piece) per sample and averaged to obtain a mean immunolabeling score for each animal.

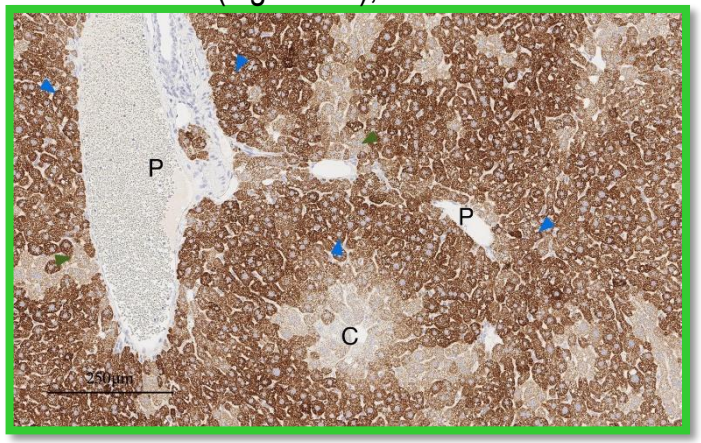
LUNAR-OTC (low dose), IHC Score = 1.2



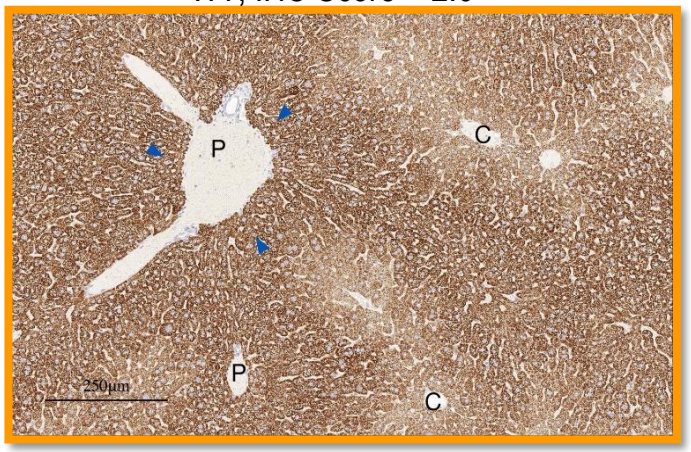
LUNAR-OTC (mid dose), IHC Score = 2.0



LUNAR-OTC (high dose), IHC Score = 2.8



WT, IHC Score = 2.6



A mixture of weak (black arrowheads), moderate (green arrowheads) and intense OTC immunolabeling (blue arrowheads) is visible surrounding portal tracts (P; immunolabeling score 2). Immunolabeling of hepatocytes surrounding central veins (C) is weak to absent.

LUNAR-OTC treatment increases OTC expression in periportal hepatocytes, main site of ureagenesis (ammonia detoxification)

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LUNAR-OTC

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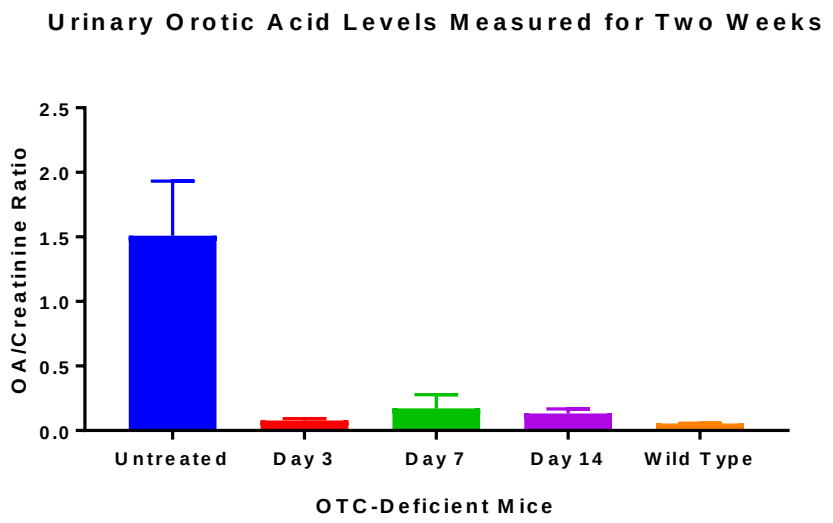
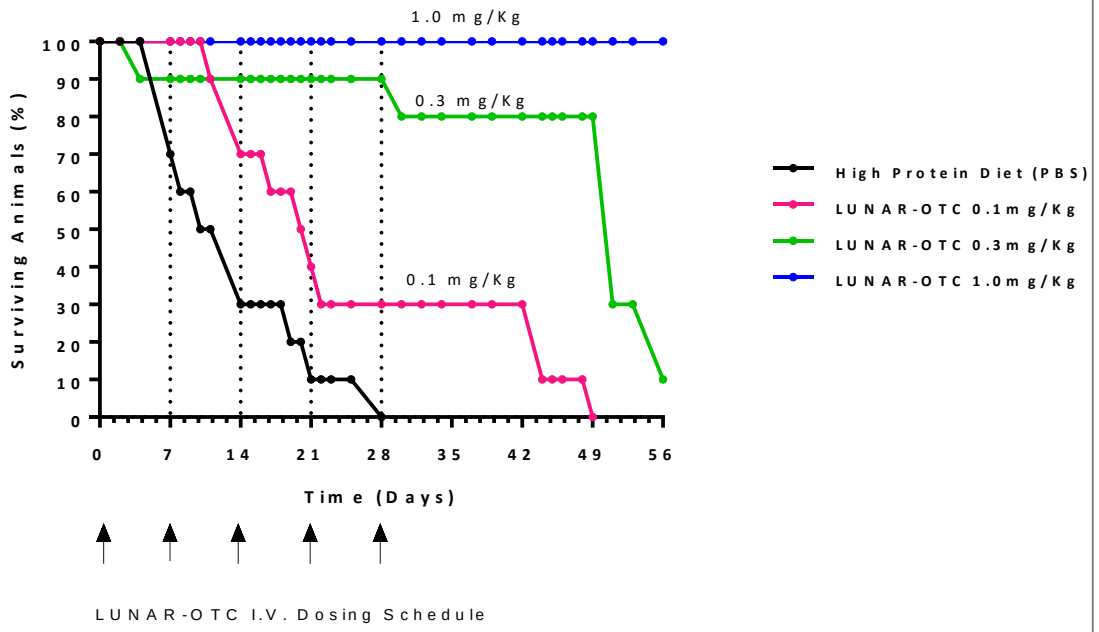
Urinary Orotic Acid Single Dose



Survival of OTC-deficient Mice on High Protein Diet Weekly LUNAR-OTC Treatment



- LUNAR®-delivered human OTC mRNA reduces Urinary Orotic Acid levels in a well-established mouse model of OTC deficiency
- Weekly dosing LUNAR-OTC protected mice from high-protein diet induced hyperammonemia and death
- 0.3 mg/kg weekly dose was sufficient to protect mice after the second dose. Potential for maintenance dose after initial loading dose

Cystic Fibrosis

Cystic Fibrosis Market Opportunity

Cystic Fibrosis: The most common rare disease in the United States

- Caused by genetic mutations in the CFTR gene, resulting in aberrant flux of ions in and out of cells, causing thick mucus buildup in lung airways
- Chronic airway obstruction leads to infection and inflammation, which causes permanent tissue scarring and respiratory failure
- 70,000 worldwide prevalence

Unmet Medical Need

- No CFTR functional corrector is approved for treatment of all patients
- Present standard of care does not effectively prevent long-term effects of mucus accumulation. CF patients with late-stage loss of respiratory function require lung transplant

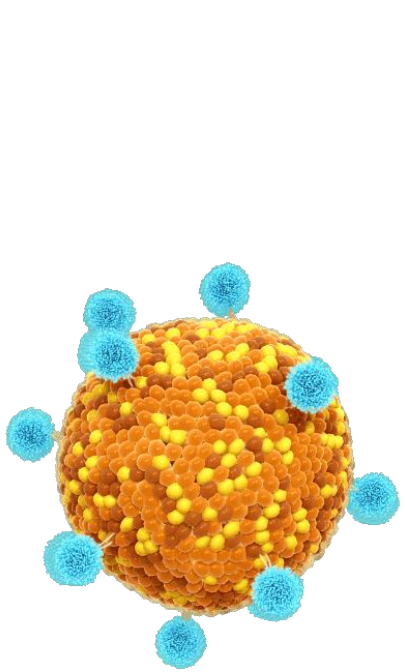
LUNAR-CF Aims to Restore CFTR Function

- An mRNA replacement therapy has the potential to deliver a new copy of CFTR into the lungs of CF-patients, independent of any genotype
- A functional CFTR protein can restore chloride channel efflux in the airways, reducing mucus accumulation, tissue scarring and minimizing the progressive respiratory dysfunction observed in CF-patients

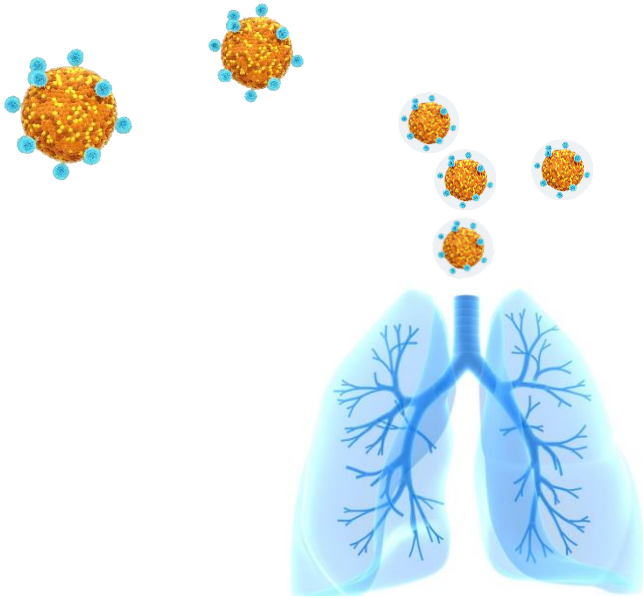
LUNAR-CF

mRNA Replacement Therapy

Cargo: mRNA



Delivery vehicle: LUNAR®



Delivery format: Aerosol

Patient Population *All patients with confirmed diagnosis of Cystic Fibrosis, regardless of mutation type*

LUNAR-CF

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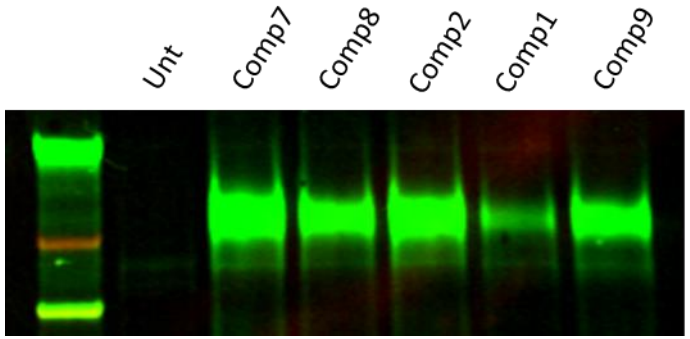
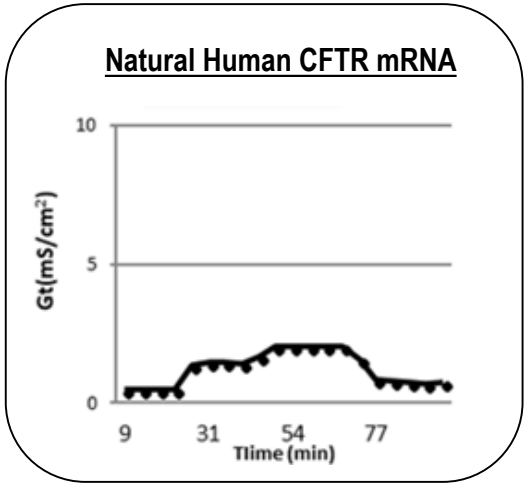
Protein and Functional Profile of Arcturus' CFTR mRNAs Validated

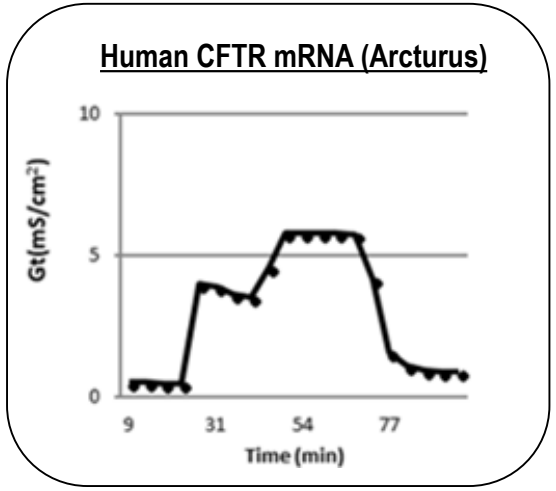
Protein Expression: *Western-Blot detection of mature CFTR protein*



- **CFTR optimized-mRNAs transfected in CFBE cells**
- **Arcturus' codon optimized mRNAs (Comps 2, 7, 8, 9) express higher levels of protein than the natural sequence (Comp1)**

Functional Assay: *Transepithelial Conductance in an epithelial cell model (FRT)*





- **Arcturus' codon optimized mRNAs are several fold more active than the natural sequence**

NEBULIZATION AND DELIVERY TO LUNG

LUNAR® Targeting Lung

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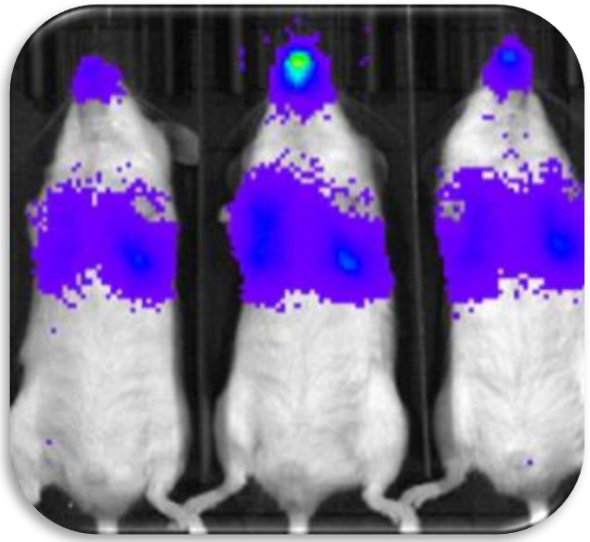
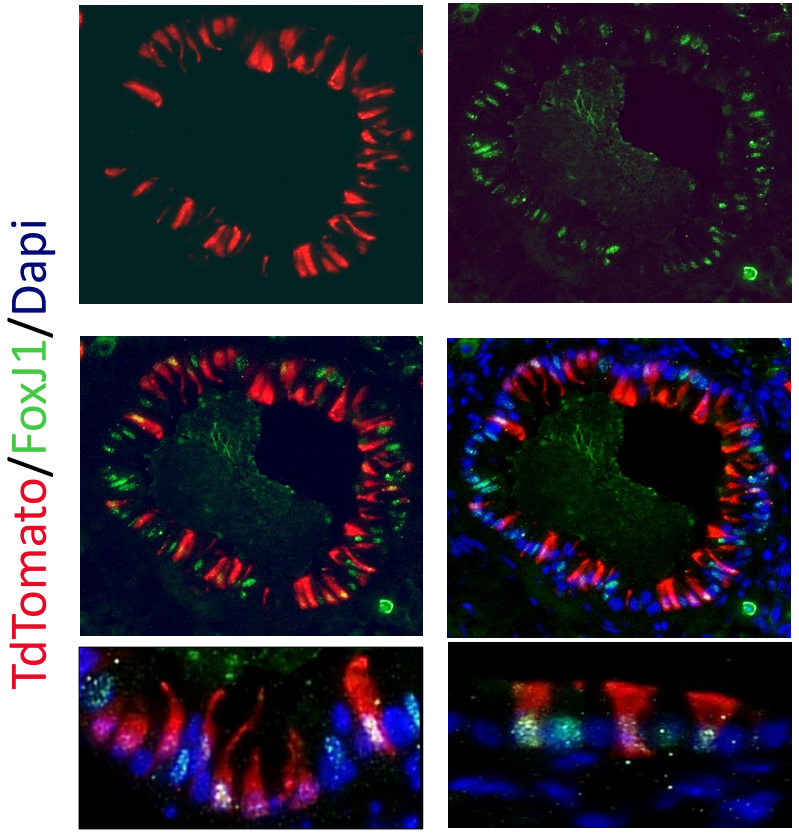
Nebulization



LUNAR-Luc mRNA

LUNAR® delivery into lung epithelial Cells



Functional Delivery of LUNAR®-mRNA into Lung Epithelial Cells

LUNAR® EFFECTIVELY DELIVERS CFTR TO THE MOUSE LUNG

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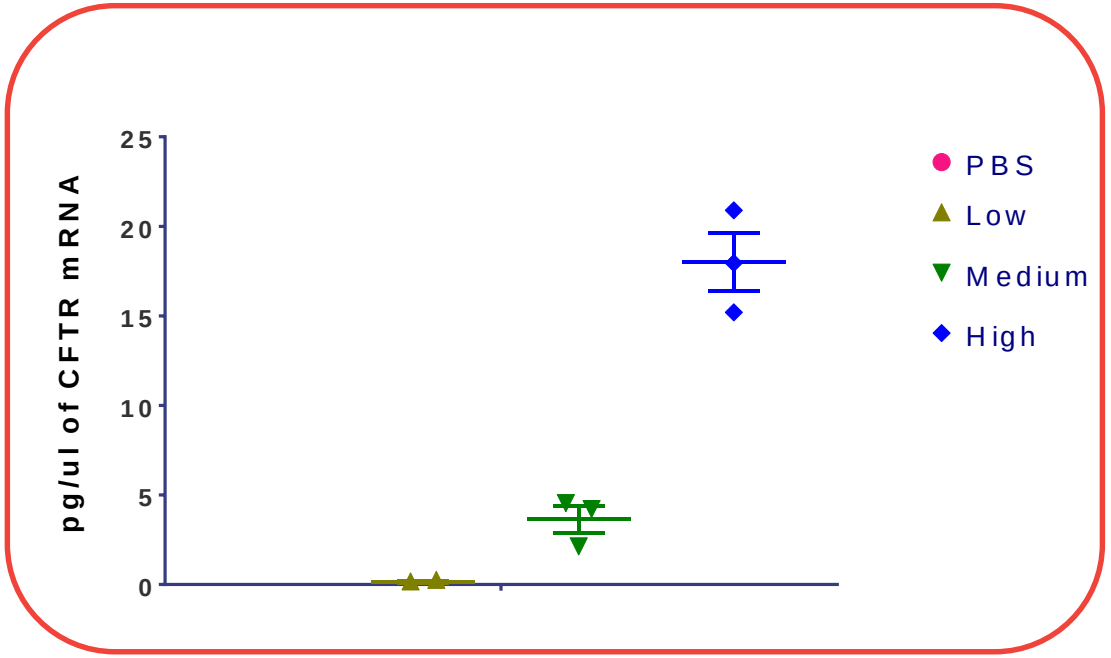
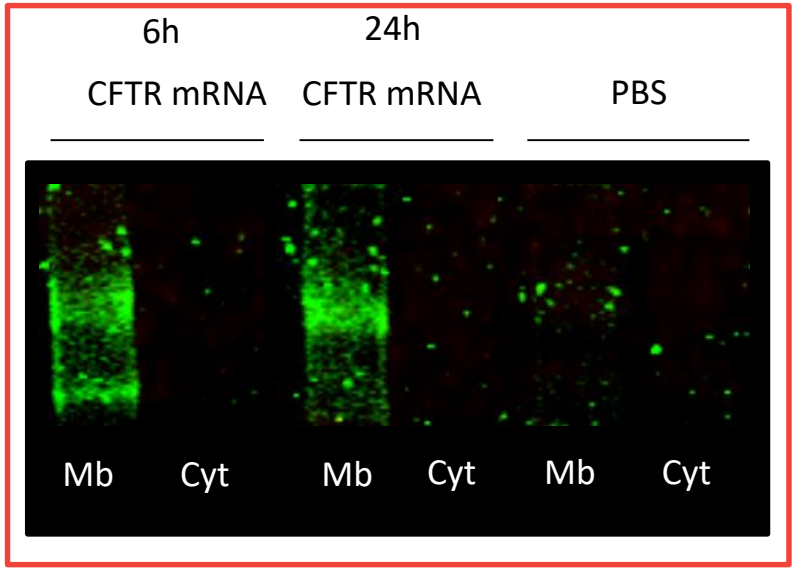


mRNA levels

Lung delivery – CFTR mRNA



Lung delivery – CFTR protein

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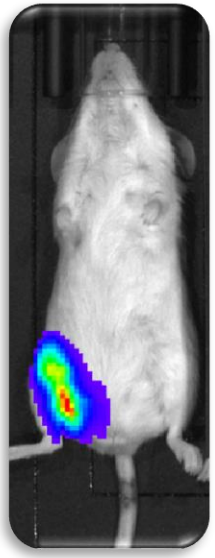
LUNAR® Enabling Vaccines

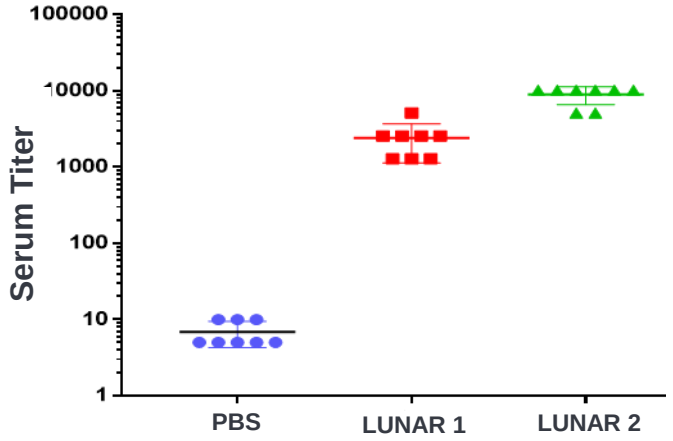
Intramuscular (IM) administration



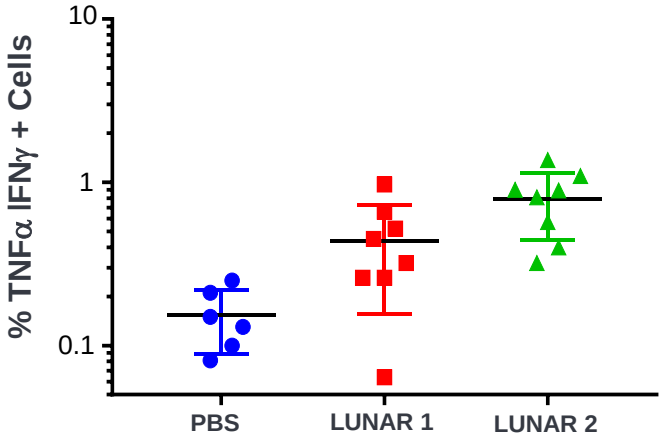
LUNAR-Luc mRNA

HA Inhibition Titer and T-Cell responses

Hemagglutination Inhibition Titer (Day 35)



CD8+ T-Cell Responses (Day 35)



LUNAR®-mRNA Platform Promotes Antigen-Specific Responses for Vaccine Applications

Summary

BUILDING INNOVATIVE
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- LUNAR® delivery platform enables all RNA medicines
  - Functional delivery of multiple RNA modalities enabled across cell types and routes of administration
  - Rational design and SAR drive continuous platform and product improvement
- In vivo proof of concept achieved for multiple programs (OTC, CFTR)
- Arcturus proprietary manufacturing processes for mRNA and DP poised to drive programs into development

ARCTURUS
therapeutics