ARNA Biosciences

Patients xRNAs Platform

Reprogramming RNA to Cure Intractable Diseases

Infinitely tunable, tissue-specific, biodegradable xRNA therapeutics

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What Came First?

The Chicken or the Egg?

A rhetorical question asked by this author of Dr. Watson circa 1992, when both were associated with the same company in NY.

"Neither. mRNA - or more broadly, RNA - came first."

"In the 'RNA world' the chicken-and-egg problem simply disappears. Being a DNA equivalent (information) as well as a protein equivalent (catalyst), RNA is both the chicken and the egg."

Dr. James Watson
DNA: The Secret of Life
Reading the Code: Bringing DNA to Life

Today's RNA Therapies Have a Durability and a Delivery Problem

❌ **Short half-life**

Requires frequent injections and limits therapeutic exposure

🚫 **PEG & LNP-based delivery**

Can trigger immune responses and long-term tissue toxicity

Dosing levels for chronic diseases will likely be fatal

⚠️ **No tissue-specificity**

Causes systemic exposure and off-target effects

⚠️ **Regulatory pressure against PEG & LNP**

Especially restricted in pediatric drug development

Result: High cost, safety concerns, patient burden, and poor scalability

The CLAD-SFH Platform: Smarter RNA Action & Delivery

- ✅ **Tunable duration**: 1 to 8+ weeks of action with a single injection
- ✅ **Engineered tissue-specificity**
- ✅ **PEG/LNP-free**: biodegradable & non-accumulative
- ✅ **Controlled release** via peptide hydrogel nanoparticles
- ✅ **Up to 1,000x dose-frequency reduction**
- 📌 *The body becomes the protein factory.*

Conventional mRNA

- ⚡ Short half-life
- 🎯 No targeting
- 💉 Frequent dosing

CLADed-mRNA

- ⏳ Tunable 1–8+ weeks
- 🧠 Tissue-specific
- ♻️ Biodegradable

CLAD: Closed-Loop Adaptive Delivery. SFH: Surface Fill Hydrogel Nanoparticles

CLAD + Surface Fill Hydrogel = Programmable RNA Delivery

1. CLADed mRNA

- CLADded structure improves stability in vivo
- Encodes for tunable **sustained** action
- Designed for **tissue-specificity**
- On-demand release via local tissue signals

2. Surface Fill Hydrogel Nanoparticles (SFH)

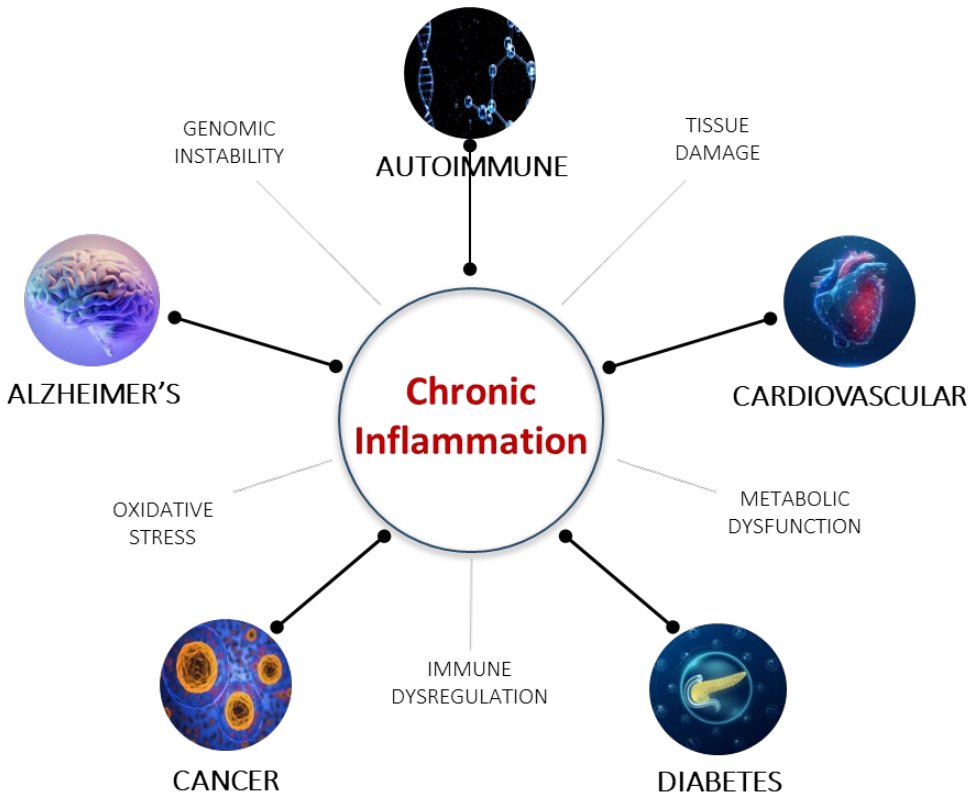
- Controls timing and location of protein expression
- **Tunable** release (1 to 8+ weeks)
- Fully **biodegradable**
- No PEG, no lipid, no accumulation

3. Therapeutic Action

- The body becomes the bioreactor
- **Targeted** action, deeper tissue impact, lower dosing, less frequent injections, higher **safety**

IDP: Intrinsically Disordered Polypeptides

A $100B+ Opportunity in RNA-Based Therapeutics



The Hidden Driver of Multiple Billion-Dollar Healthcare Markets – from Alzheimer's to Cancer

🧬 Total Addressable Market (TAM)

- RNA therapeutics market size projected at **$135B+ by 2030**
- CAGR of **9%** (2023–2030)
- Includes: mRNA, saRNA, siRNA, circRNA, and mixed xRNA modalities

🎯 Beachhead Market – Inflammation + Oncology Axis

- **$30B+ annual spend** in oncology RNA drug development
- High unmet need in targeted, durable therapies
- Existing mRNA solutions face durability, delivery, immune, and toxicity barriers

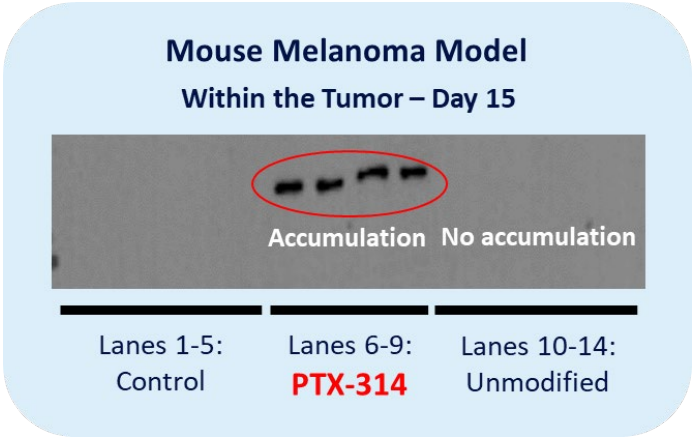
🏁 Why Now?

- Big Pharma is investing aggressively in RNA:
  - Sanofi–Translate Bio ($3.2B)
  - Sanofi–Amunix ($1B+)
  - Horizon–Viela ($3B)
  - **Novartis** – allocated **$5B** with an **eye for early science**!
- COVID accelerated RNA adoption → now expanding into chronic disease

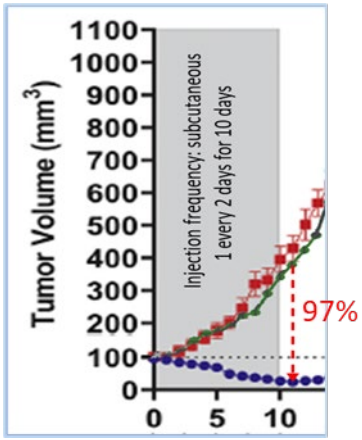
Breakthrough Tumor Reduction in Preclinical Models

- ✅ **97% tumor volume reduction**
  In EpCAM+ breast cancer model with CLADded targeting molecule
- ✅ **83% tumor shrinkage from a single injection**
  SFH-controlled miRNA delivery over 5 weeks (tunable)
- ✅ **3x reduction in metastasis**
  Anti-inflammatory cytokine delivery blocked breast cancer spread to bone
- ✅ **Targeted accumulation**
  Molecule concentrated in tumors, not in heart, lungs, or blood
- ✅ **Immune activation**
  Boosted trafficking of NK/CD8+ cells into tumor microenvironment

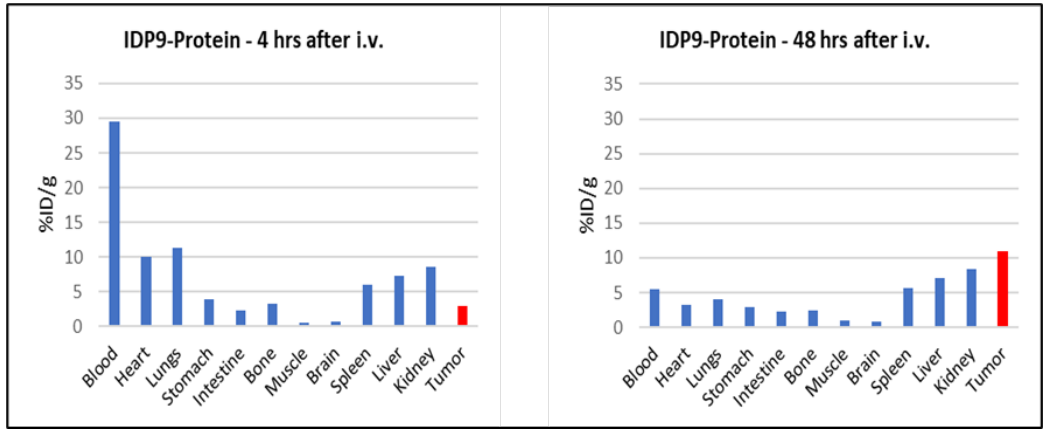
Tumor accumulation of molecule with and without CLADing



Tumor reduction with and without CLADing



Molecule localizing in tumor vs. other tissues



Targeted Programs in Oncology and Inflammation

Program	Indication	Stage	Key Milestone
ARNA-101	Inflammation-oncology	Preclinical	IND filing – 21-24 mths
ARNA-102	Inflammation-oncology	Disc/early preclin	IND – 36 mths
Platform Licensing	Partnered RNA programs	Exploratory	Ongoing BD discussions

✳️ **Notes:**

- **ARNA-101**: Tumor targeting of multiple cancers via multivalent CLADded-mRNAs encoding anti-inflammatory and antitumorigenic cytokines as monotherapy ± PD-1/L1 checkpoint inhibition
- **ARNA-102**: Immune modulation in chronic inflammatory tumors
- **Licensing**: Platform use for RNA payloads outside oncology (e.g., rare disease, vaccines)

What Makes ARNA Different — A New RNA Treatment and Delivery Paradigm

Feature	ARNA	Moderna	BioNTech	Amunix-Sanofi
mRNA or Mixtures	✅	✅	✅	✅
PEG & LNP-Free / Biodegradable	✅	❌	❌	❌
Surface-Fill Hydrogel Nanoparticle Delivery	✅	❌	❌	❌
Encoded for Tunable Sustained Action	✅	❌	❌	❌
Tunable Controlled Release (1-8+ weeks)	✅	❌	❌	❌
Integrated Delivery – Sustained + Controlled	✅	❌	❌	❌
Dual/Staggered Protein Delivery	✅	❌	❌	❌
Platform Licensing Ready	✅	❌	❌	❌

💡 ARNA is the only platform offering tunable, integrated sustained-action + controlled-release, biodegradable, and tissue-specific RNA therapeutics — without PEG or lipids.

Two Engines of Value Creation: Pipeline + Platform

Internal Pipeline

🧪 Therapeutic Development

- Focused on the inflammation-oncology axis
- Full control from discovery → clinical trials
- Enables early proof-of-concept and premium exits

💰 Monetization

- Traditional biotech model: licensing, co-dev, acquisition
- Value inflection points: IND → Phase I POC → Series A/B

Platform Licensing

🔁 Delivery-as-a-Service for RNA Payloads

- Out-license CLAD-SFH delivery tech to pharma partners
- Compatible with mRNA, miRNA, siRNA, saRNA, circRNA

🤝 Revenue Streams

- Upfront license fees
- Development milestones
- Royalty-based revenue
- Co-development opportunities

A Deep IP Portfolio + Strategic Government Partnerships

🧬 Intellectual Property (ARNA-Owned)

- **4+ Provisional/In-Prep Patents**
  - CLAD structure & delivery system
  - Methods for xRNA encoding and control
  - Unnatural amino acids + expression constructs
- **In Preparation:**
  - Full PCT filings (Q1/2026)
  - National phase entries (Q3/2026)

🏛 Strategic Collaborations & Licensed IP

- **NIH/NCI**
  - Covers peptide hydrogel nanoparticle delivery
  - Non-liposomal, PEG-free, non-immunogenic platform
- **Licensed Patents (NIH/NCI):**
  - WO2019/117976A1 — Peptide hydrogels
  - WO2019/157381A1 — Composite delivery systems

🛡 Our IP protects not just the molecules — but the method of delivery and the modular platform.

Veteran Biotech Builders with Deep Domain Expertise

Rajiv Datar, PhD, EDP (MIT)
Co-Founder & CEO
Alfa-Laval/Kabi/Pharmacia, Genentech
Post-Doc/Doc from MIT/KTH

Carl K. Edwards, III, PhD
Scientific Co-Founder
MM Dow, Synergen, Amgen
A World-Renowned Immunologist

John Caputo
Co-Founder & Act. CFO
Entrepreneur/Hedge Funds/Capital Markets

Post-Doc 1, PhD
Sr. Scientist/Post-Doc 1
Preclinical Development
NCI/NIH

Post-Doc 2, PhD
Sr. Scientist
NCI/NIH

Post-Doc 3, PhD
Sr. Scientist
UOM

Post-Doc 4, PhD
Sr. Scientist
Sanger

Expertise

100+ PERSON-YEARS of experience developing biopharmaceuticals. 6 INDs and 5 products.

Partners & Collaborators

NIH National Cancer Institute · Manchester Breast Centre · The University of Manchester · wellcome sanger institute · University of Colorado Boulder · Creative Biomart® · City of Hope Research · Treatment · Cures

Our Backgrounds

Genentech · Lilly · KabiVitrum · Pharmacia · Novartis · Schering-Plough · Johnson & Johnson · Amgen

World-Class Partners Supporting Our Science and Strategy

NIH NATIONAL CANCER INSTITUTE

- **Startup 2.0 license**
- **CRADA agreement**
- Shared IP: Hydrogel nanoparticles
- Preclinical model co-development

University of Colorado Boulder — *Anschutz Medical School*

Prof. Charles Dinarello, MD

- Pioneer in cytokine biology & chronic inflammation
- Studying PRR-targeting via xRNA therapies

Manchester Breast Centre

MANCHESTER 1824 The University of Manchester — *Manchester Breast Centre*

Prof. Robert Clarke

- Breast cancer + metastasis modeling
- Joint studies on CLAD-induced tumor regression
- DoD-CDMRP plus other grant applications

wellcome sanger institute | University of Cambridge

Dr. Thomas Mitchell

- Renal carcinoma + EMT inhibition
- Investigating immune cytokine interactions with CLAD delivery

$6M Seed Round Now to De-Risk Our Lead Program to IND

Module	Duration	Milestone	Funding Required
1	12-15 months	AI Design + Preclinical development	**$6M**
2	9 months	IND-enabling tox studies + GMP production	$5M
3	9 months	Phase I trial (25-30 patients, solid tumors)	$4M

🧩 Key Use of Funds – Current Round ($6M)

- AI-driven CLAD-xRNA construct design
- Integration of CLAD and SFH nanoparticles
- Small-scale production & analytical development
- in vitro & in vivo PK/PD assessments
- NCI-CRADA execution
- Pre-IND preparation and meeting

🟦 Preclinical → 🟧 Series A Inflection Point →
🟦 IND-Enabling → 🟥 Phase I

Positioned for Pharma Acquisition or Strategic Partnership

Exit Stage	Example Deal	Estimated Valuation
Pre-IND Exit	Sanofi–Tidal Therapeutics ($470M)	$500M–$1B
Post-Phase I POC	Pfizer–Arvinas ($3.2B)	$2B–$3B+
Post-Phase II/III	Novo–Dicerna ($3.3B)	$5B+

🎯 Why ARNA is Well Positioned

- Platform play with multiple therapeutic shots on goal
- Broad IP and CRADA partnership (non-dilutive validation)
- Early proof of tumor targeting and immune modulation
- Tunable, PEG-LNP-free delivery solves known pharma bottlenecks

Timeline Flow: Product Development → Series A → IND → Phase I POC → Exit

Let's Build the Future of RNA Medicine – Together

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Thank you!

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