

Omnyra

Initial Problem Statement

Easy access to DNA synthesis and weak buyer checks let bad actors slip through and make dangerous biological agents.

Final Problem Statement

Existing safeguards miss AI-generated threats and the government lacks visibility into today's bioengineering capabilities.

130 Interviews



Kari Montoya, FBI
Problem Sponsor



Nelson Layfield, FBI
Government Mentor



Sal Badillo-Rios, DIU
Government Mentor



Laura Clapper, MD
Business Sponsor



Mark Clapper, MD
Business Sponsor

Our Team: A Mix of Computer Science & Biology



Emilin Mathew

BS in Computer
Science & Biology



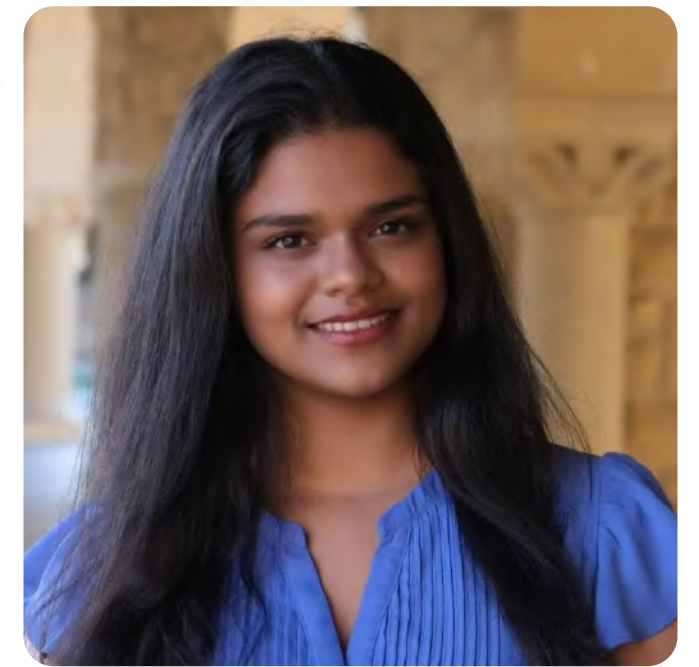
Taralyn Nguyen

BS in Computer
Science & Management



Stefan Thottunkal

MD/MS in Community
Health and Prevention
Research



Varsha Saravanan

BS & MS in Computer
Science



Highs, Lows, and Lightbulbs...

Week 1-2

Initial
Discovery

So much to
learn, can't wait!

Week 3-4

But who actually CARES?
We're **overwhelmed**

Week 5-6

What's Most
Pressing?

The FBI and DNA
Synthesis Companies
are invested. Let's test
our MVPs!

Map Beneficiaries
+ Get out of the
Building!

Week 7-8

Much feedback to
process! Let's continue
learning and iterating

Week 9-10

Design, Iterate
and Explore
Deployment

We've connected the
dots. Let's dream
bigger and continue
our journey...



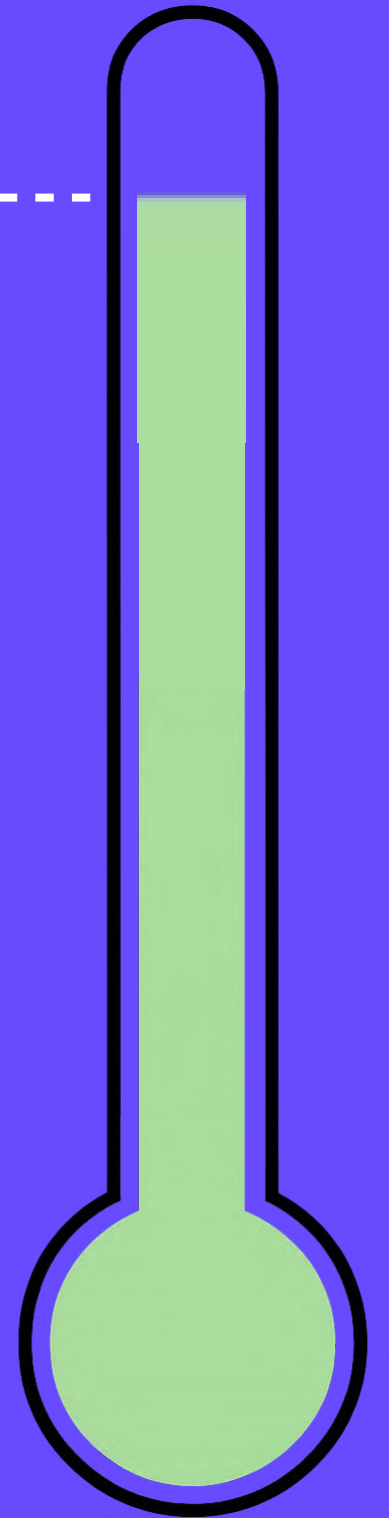
Week 1-2

21 Interviews in...

Understanding Problem Space

Emotion Meter

Excited ----



Suspicious Order



Biosynthetic Company



Bioweapon Built



Catastrophic Outbreak



Some companies assume every customer is safe. That assumption could be deadly.

"It's not our job to verify customers' orders."

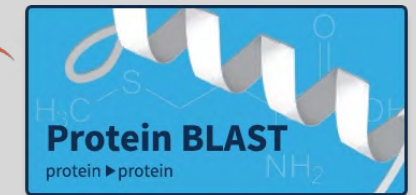
– U.S. DNA Synthesis Company

We Interviewed Every Major U.S. Competitor in Biosecurity Screening

1 Customer Screening Tool



5 Sequence Screening Tools



SecureDNA



We mapped the field.
Every tool follows the
same outdated playbook.

BLASTN programs search nucleotide databases using a nucleotide query

Enter Query Sequence

Enter accession number(s), gi(s), or FASTA sequence(s) [?](#) [Clear](#)

Query subrange [?](#)

From

To

Or, upload file No file chosen [?](#)

Job Title

Enter a descriptive title for your BLAST search [?](#)

☐ Align two or more sequences [?](#)

Choose Search Set

Database

☒ Standard databases (nr etc.): ☐ rRNA/ITS databases ☐ Genomic + transcript databases ☐ Betacoronavirus

Core nucleotide database (core_nt) [?](#)

Organism
Optional

Enter organism name or id—completions will be suggested ☐ exclude [Add Organism](#)

Enter organism common name, binomial, or tax id. Only 20 top taxa will be shown [?](#)

Exclude
Optional

☐ Models (XM/XP) ☐ Uncultured/environmental sample sequences

Limit to
Optional

☐ Sequences from type material

Entrez Query
Optional

[YouTube](#) [Create custom database](#)

Enter an Entrez query to limit search [?](#)

Existing Tools Have Little Defense Against Modern Threats

VSSQCVNLTTRTQ

VS

VSSQCVNLTTRTQ

Direct Match

Detected

VSSMMMNLTTRTQ

VS

VSSQCVNLTTRTQ

Minor Changes

Maybe Detected

ATTQCVNTLTACT

VS

VSSQCVNLTTRTQ

Large Rewrite

Not Detected

ATTCDWVNMWQ

VS

VSSQCVNLTTRTQ

Entirely New Threat

Not Detected

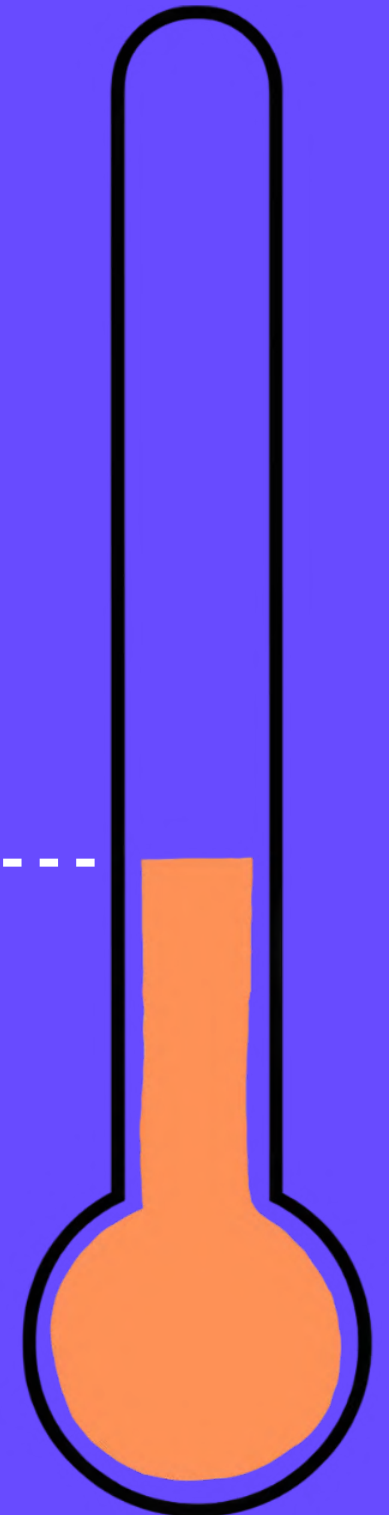
Week 3-4

50 Interviews in...

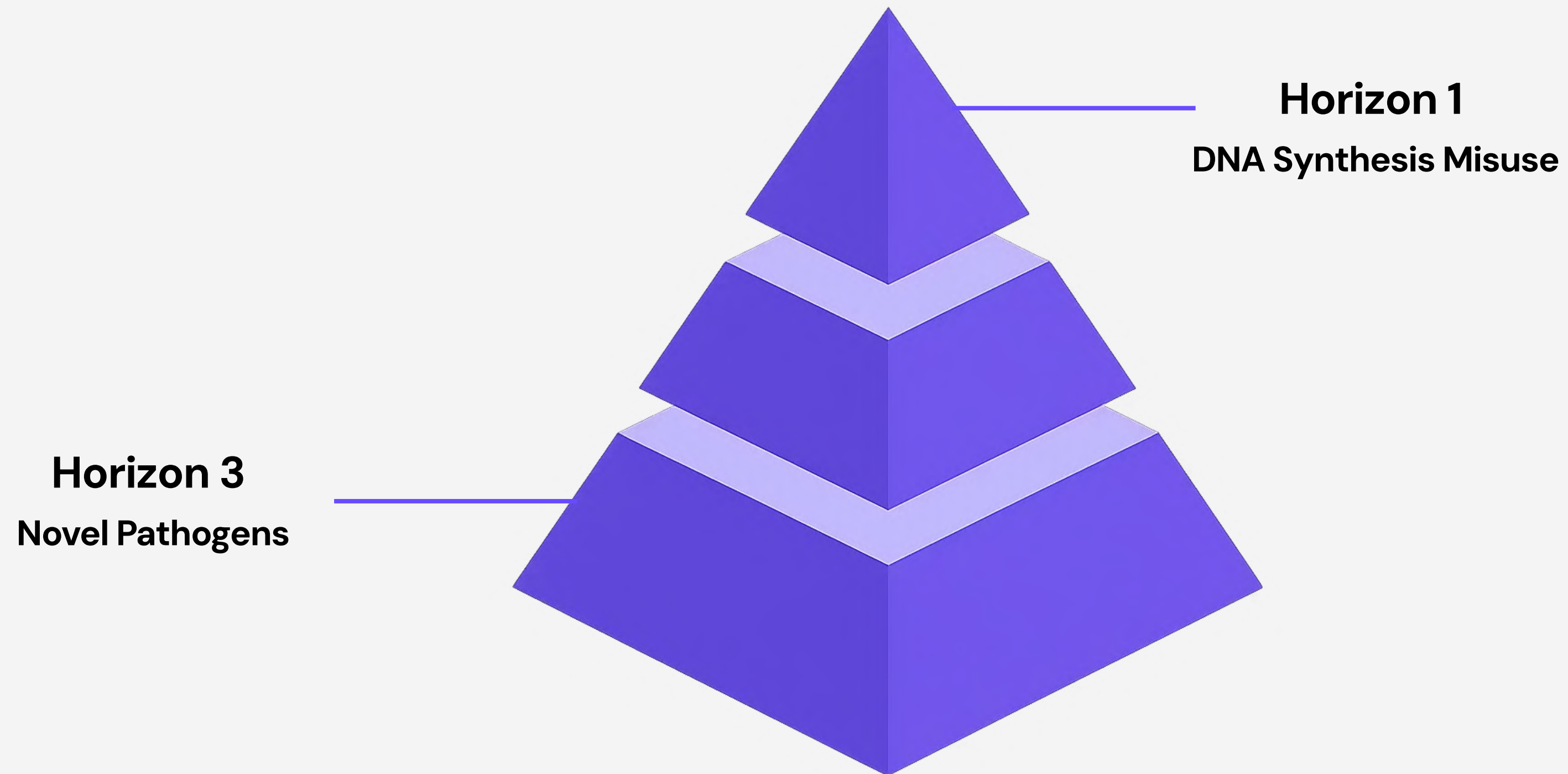
What's Most Pressing?

Emotion Meter

Overwhelmed ----



We Started With Active and Strategic Threats



We Noticed Conflicting Perspectives

“We do not see novel pathogenic orders often – it is not a pressing threat.”

– Chief Security Officer of U.S. DNA Synthesis Company

“95% of threats the HQ deals with are engineered in some capacity.”

– Intelligence Analyst at FBI Headquarters

But, We Were Still Missing Something Critical



Horizon 2
AI Edited Sequences

**AI-Edited Pathogens
are more PRESSING
than anticipated.**

**Current Safeguards are
likely to FAIL yet very
few are talking about it.**

We Received Early Support!



**National Institute
of Health**



**Aclid &
SecureDNA**



Twist Biosciences



**National Security
Commission for
Emerging
Biotechnology**

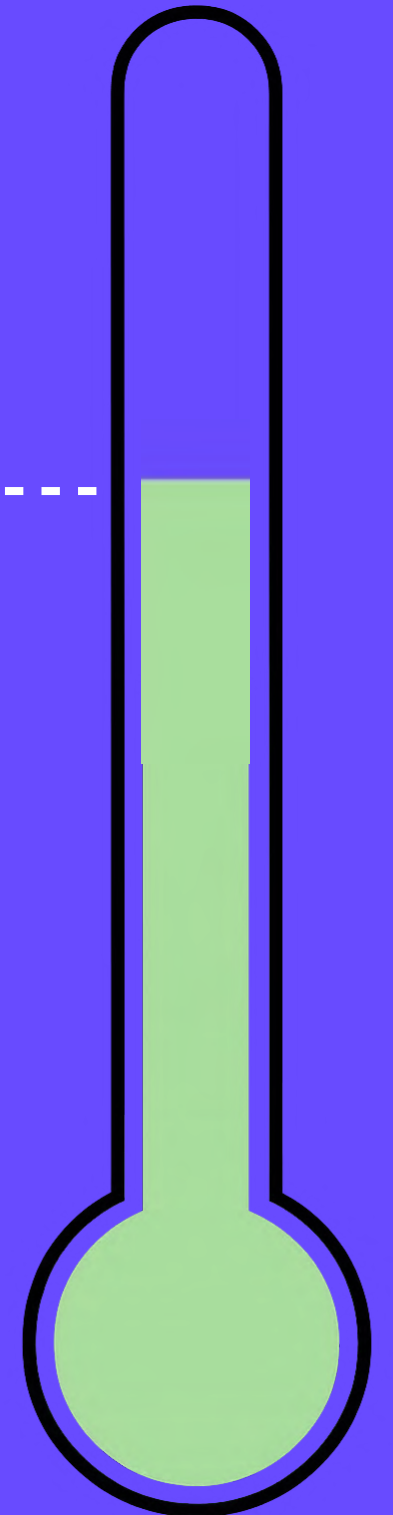
Week 5-6

78 Interviews in...

Does anyone else care? + Get
Outside the Building!

Emotion Meter

Inspired ----



At First, We Missed the Full Picture

Bad Actor



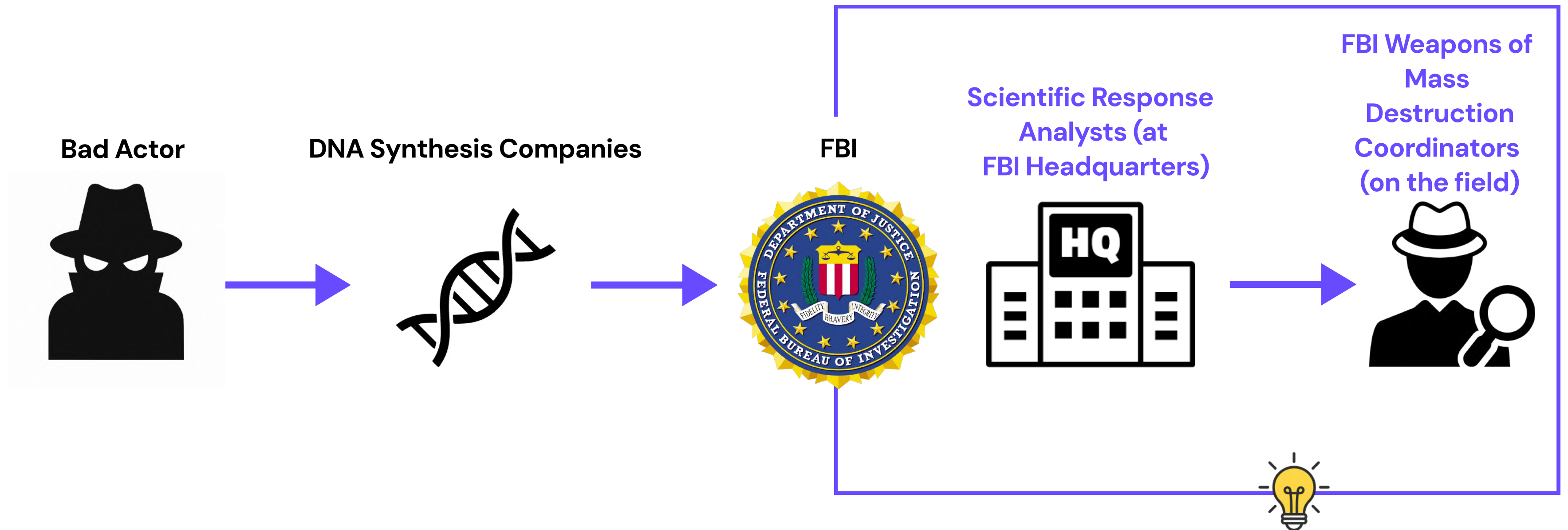
DNA Synthesis Companies



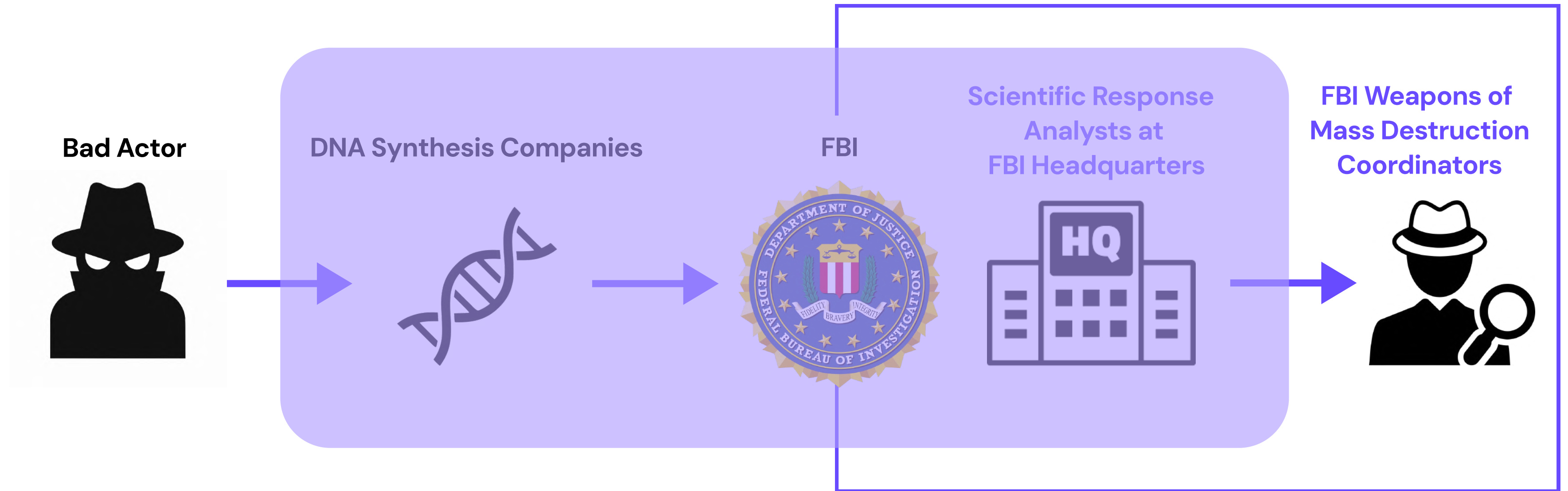
FBI



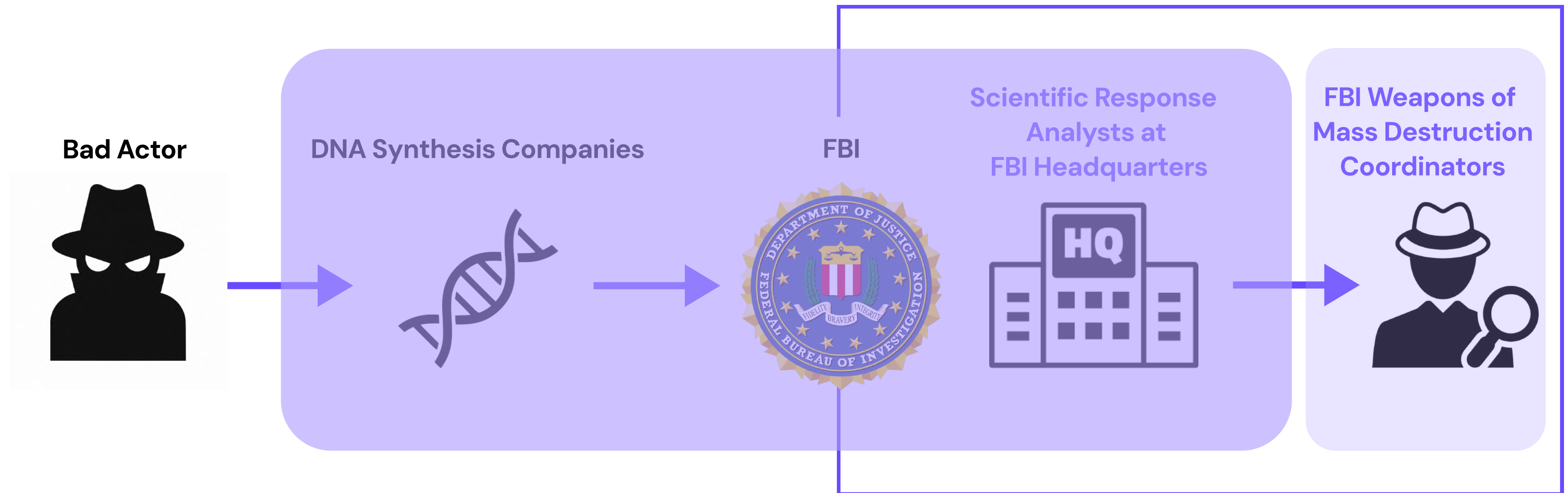
Missing Piece: Clarifying the FBI Workflow



Pinpointing the Primary Beneficiaries



Reframing WMD Coordinators as Secondary Beneficiaries



We Got Out of the Building

→ in person connections

→ real world context

→ unexpected opportunities



**Dr. Drew Endy's
Lab**



**Lawrence Berkeley
National Laboratory**



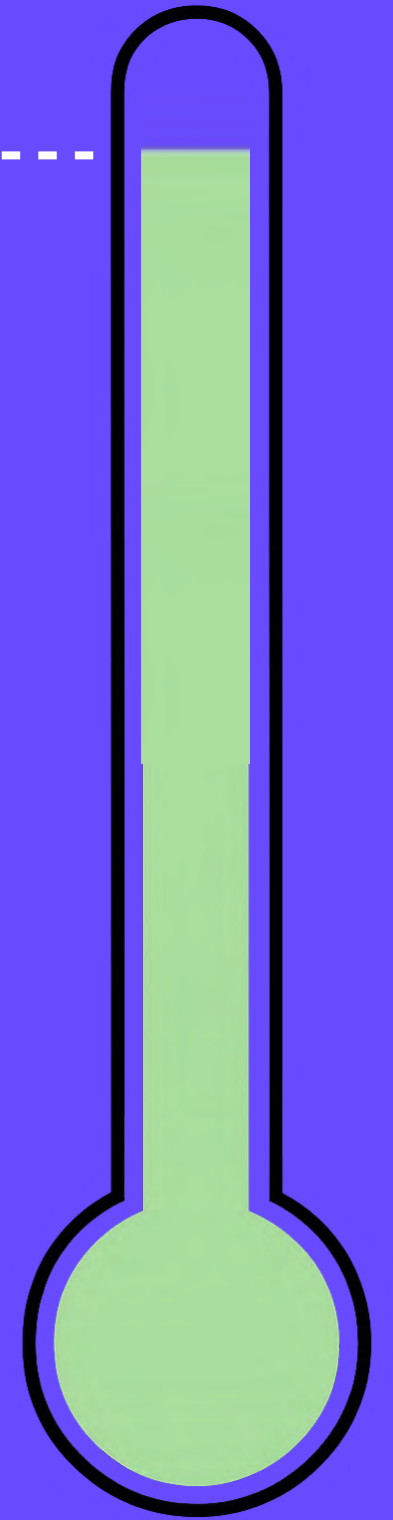
**SynBioBeta
Conference**

Week 7-8

108 Interviews in...

Emotion Meter

Growth Minded ----



Build, Validate, and Iterate

We're Building a Technical Moat: The First AI-Native Biosecurity Stack



1 – Synthetic Pathogen Database

Approach	Value Added
Function Preserving Framework	Simulates real-world evasion tactics to find what legacy tools fail to catch



2 – AI Classifier

Pipeline	Value Added
Analyst Ready Report	<ul style="list-style-type: none">• Confidence score• Predicted function or family
Classifier Layer	Predict functional risk (toxin vs non-toxin)
Pretrained Models	Use protein LMs to extract function from sequence.

Testing Interface: AI-Native Pathogen Detection For Industry



Omnyra is an AI-driven platform designed to detect synthetic biological sequences that evade traditional homology-based screening tools. We offer streamlined FBI reporting options based on flagged risk levels. Our team is actively evaluating various sequence encoders, fine-tuning strategies, dataset curation pipelines, and embedding-based detection methods. Check out our demo to learn more about our vision!

FASTA input

```
>OMNYRA_SYNTHETIC_01 AI-edited analog of Variola virus strain India-1967 [Synthetic]
ATGGAGGATTATAACATATTCGGCACACAAAAGAAATAATGAAGATATACATA
AAGTTTGAGAATATTAA
ATCTAGAGATATCTATTATTATTACAGAAAATACAGGTAAGGATAAGATACTTT
ATTTCTTTAATTTTATT
ATTGAATATAATTGTTTATAAAGGTAAGTGTGTTTATGATGTTTCTAAAACGATGT
TTTCAAACTAGAGAGAA
TCTTCTATATTTTATATTAAACTTGTCTAGAAAATAAGGATGGGATTATTTATAGA
```

Submit

Natural Matches

AI-Edited Variants

Synthetic Functional Analog

0–50 bp 51–100 bp 101–150 bp



⚠ Pathogen Detected: Synthetic analog of *Variola virus*. Confidence level: High

View Threat Analysis Report

Threat Analysis Report

Threat Interval
0–150 bp

Virulence Score
High

Explore reporting options:

✓ Flagged

✓ Blocked

Report to FBI

[View all flagged and blocked orders](#)

Related variants in GenBank:

[NC_001611.1](#) [AY243312.1](#) [AY243313.1](#) [AY243314.1](#) [AY243315.1](#) [AY243316.1](#)

We're building something that doesn't currently exist but is needed.

Our Screening Tool Received Positive Feedback And Interest

Open to collaborating if Omnyra excel in speed, accuracy, and/or cost.

– Two Major Screening Tools in Market

... Companies will appreciate the inbuilt ability to report to FBI when threats emerge.

– Postdoc at Engineering Biology Research Consortium

How Do These Insights Inform a FBI-Facing Tool

**Solve Bottleneck in
Threat Reporting
at FBI Headquarters**

+

**Seamlessly Integrate
with Existing Pipeline**

We Designed The First SynBio Threat Triage Tool For The FBI

FASTA Input

```
>OMNYRA_SYNTHETIC_01 AI-edited analog of Variola virus strain India-1967 [Synthetic]
ATGGAGGATTATAAACATATTCGGCACACAAAAGAAATAATGAAGATATACATA
AAGTTTGAGAATATTAA
ATCTAGAGATATCTATTATTATTACAGAAAATACAGGTAAGGATAAGATACTTT
ATTTCTTTAATTTTATT
ATTGAATATAATTGTTTATAAAGGTAAGTGTTTATGATGTTTCTAAAACGATGT
TTTCAAACTAGACAGAA
```

Submit

Natural Matches

AI-Edited Variants

Synthetic Functional Analog

0–50 bp

51–100 bp

101–200 bp

⚠ Pathogen Detected: Synthetic analog of *Variola virus*. Confidence level: High

View Threat Analysis

Threat Analysis Report

Threat Interval: 0–150 bp
Virulence Score: High
Explore reporting options:

Launch Investigation

View Full Report

Related variants in GenBank:

AY999001.1 AY999002.1 AY999003.1

Launch Investigation

Method of Investigation:

e.g. Contact San Francisco WMD Coordinator (Kari Montoya)

Threat Priority Level:

Select Priority

Notes:

Add any relevant context or comments...

Send Report

**They Just Dropped The Mandate.
*We Already Built The Tool.***



▮ PRESIDENTIAL ACTIONS

IMPROVING THE SAFETY AND SECURITY OF BIOLOGICAL RESEARCH

Executive Orders

May 5, 2025

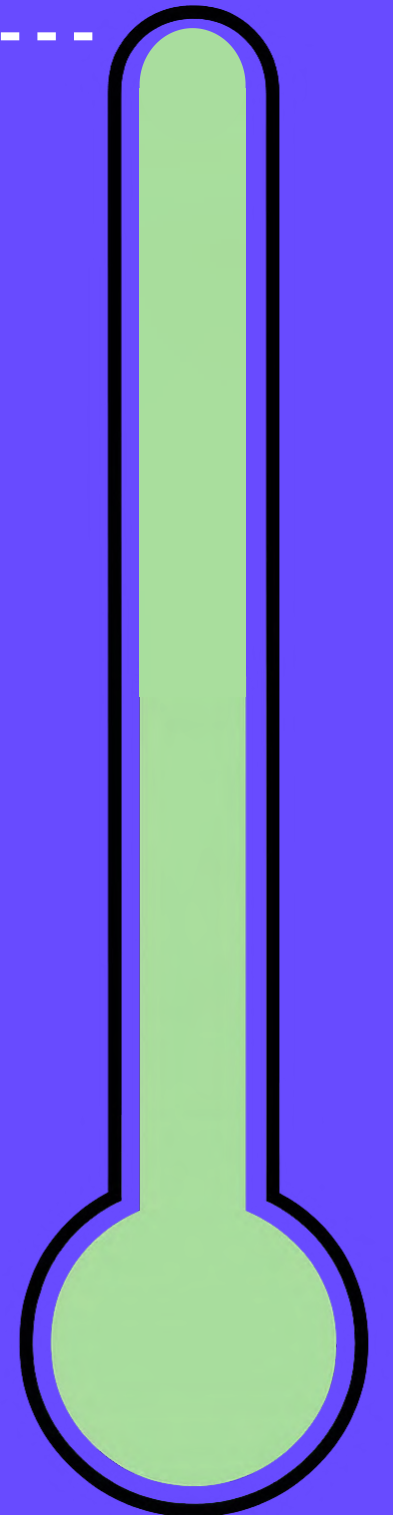
Week 9-10

130 Interviews in total

Deployment + Post Class Journey...

Emotion Meter

Fired Up ----



Positioning to Define the Dual-Use Future

Where Our Existing Tech Goes Next

DIU Commercialization Summer Fellowship

FBI Pilot

Inform EO policy via OSTP conversations with our domain insights

Collaborate with screening providers

Strategic Extensions

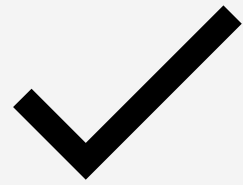
Gene function annotation

Deployable battlefield biosensors

Generative protein design platforms

Predictive drug discovery framework

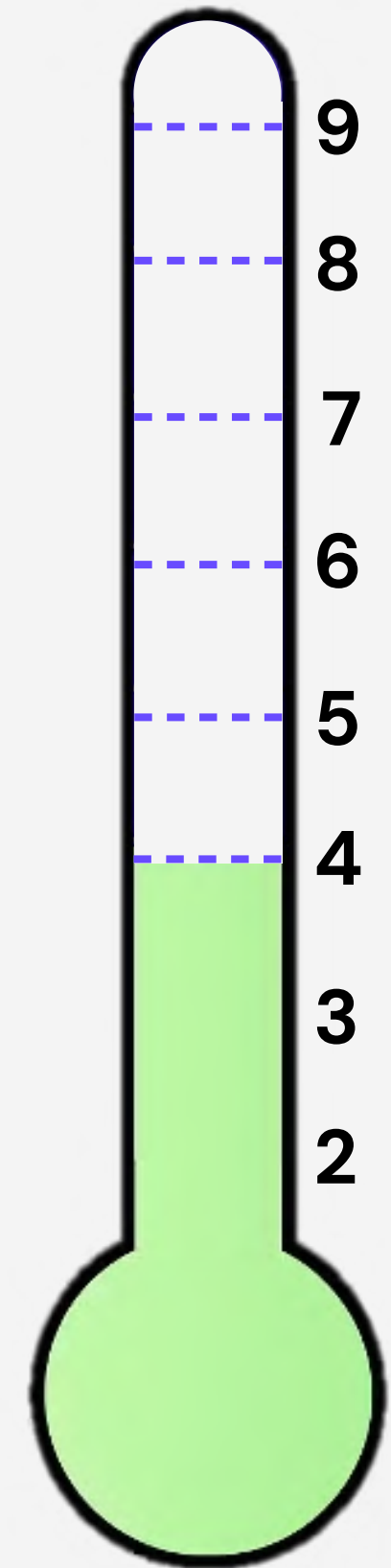
Our Technology and Investability Readiness Levels = 4



Completed scoping
research to prove feasibility



Prototyped minimum fidelity
MVP – proving it can detect
sequences with high AI edits



AI Usage

We used AI to
augment our work,
to consult and assist
– not replace

