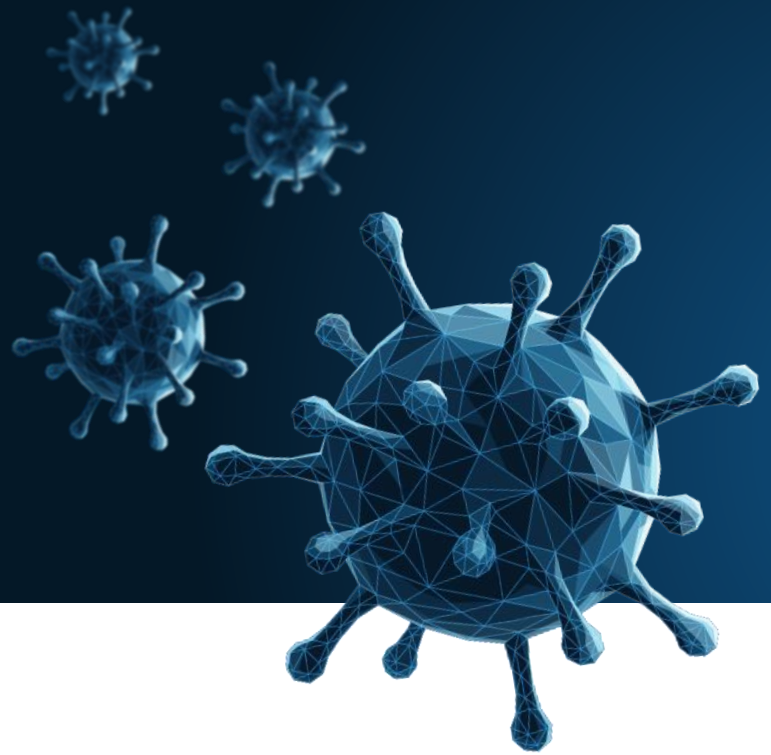

IMPROVE VACCINE EFFICACY AND GET RID OF THE JAB

Precision Delivery Solutions

PharmaJet®

Needle-Free Injection™

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PharmaJet®

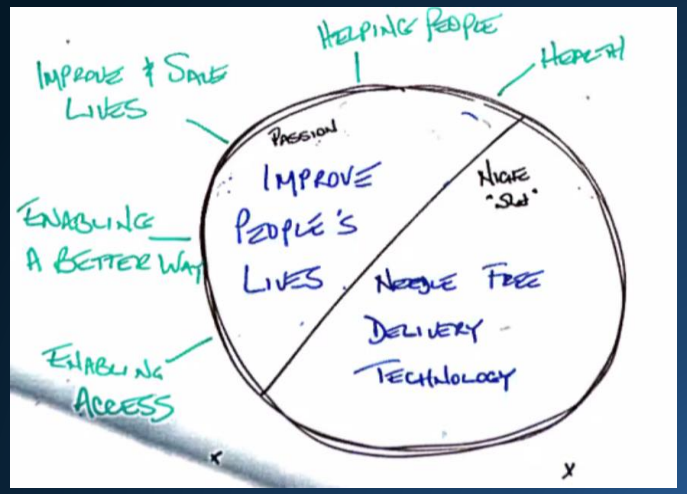
Needle-Free Injection™

Mission:

We engineer precision delivery solutions that overcome the challenges of our vaccine and pharmaceutical partners.

Vision:

Enable greater access to life-saving vaccines and pharmaceuticals globally.



How:

- ✓ Equivalent or improved effectiveness
- ✓ Improved economics
- ✓ Better patient & caregiver experience

Most partners come to us for one/multiple of the following reasons:

IMPROVED STUDY RESULTS

Data from nucleic acid and other injectable studies has repeatedly shown:

- **Improved immunogenicity** compared to needle & syringe*
- Non-inferior immunogenicity compared to **electroporation***

HIGH ACCEPTABILITY

87% of Healthcare Workers prefer needle-free*

- No needle-stick injuries
- ID jet injection is easier than Mantoux

93% of Patients & Caregivers prefer needle-free*

- No needle-phobia, improving patient/caregiver experience
- More acceptable than electroporation

ID or Dose savings

Significant dose savings potential

- Injector sets the dose
- Transition from a 0.5 ml IM injection to a 0.1 ml ID and **maintain effective immunogenicity***

COMMERCIAL SUCCESS

- Ideal for mass vaccination campaigns in both urban & rural settings
- **More cost effective** than N/S*
- Differentiation in the marketplace
- Improved **vaccine compliance**

PharmaJet's Needle-Free Injection Systems

deliver a spring-powered injection in a 10th of a second by means of a narrow stream of fluid that penetrates the skin with a precise dose and depth.

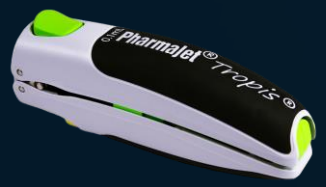
NO needle

NO external power source

- Fixed volumes (variable dose devices in development)

Tropis® ID

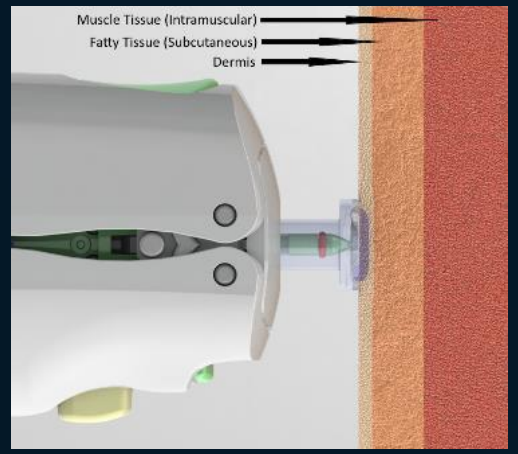
Needle-Free Injection System for 0.1 ml Intradermal Injections



INJECTOR

0.1ml SYRINGE

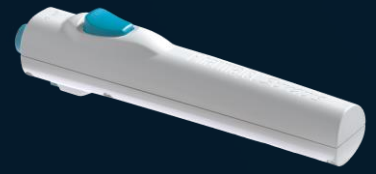
ADAPTER



ID injection with Tropis

Stratis® IM/SC

Needle-Free Injection System for 0.5 ml Intramuscular or Subcutaneous Injections

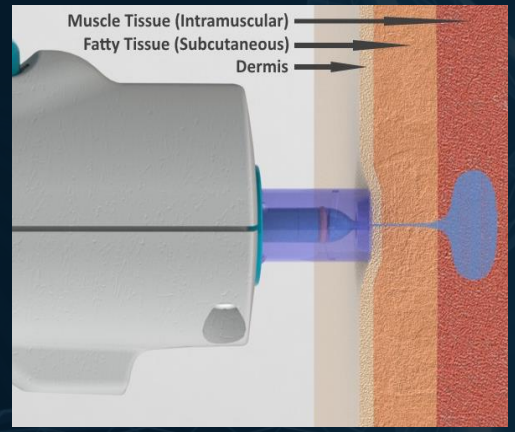


INJECTOR

RESET STATION

0.5ml SYRINGE

ADAPTER



IM injection with Stratis

Intradermal Delivery with Tropis

Mantoux Technique

- Technically difficult
- Slow
- Painful

Needle-Free Technique

- Simple
- *Very* rapid (<0.1 sec)
- Consistent

Tropis®

- Spring-powered
- Handheld, provides safe, fast and easy 0.1 ml administration to the intradermal layer
- CE Mark; 1st and only needle-free system with WHO Prequalification

PERFORMANCE QUALITY SAFETY

Tropis Field Use for IPV

- Ideal for mass vaccination campaigns
- Improved vaccine compliance
- Easy to roll out and train vaccinators

GAMBIA

fIPV Assessment (2016)

PMID: 34951974

Significant dose savings (10 full dose vial)

- 50 doses/vial with N/S
- **63 doses/vial** with Tropis

CUBA

fIPV Campaign Launch (2019)

- 130 vaccinators trained
- **92%** satisfaction
- **94%** likely to recommend

PAKISTAN

fIPV Large Scale Campaign Use (2019)

PMID: 31983581

- Cascade Training
- 2019: **500,000** children vaccinated in **5 days**
- 2020: **900,000** children vaccinated in **3 weeks**
- 2020-2021: **+2M Children** vaccinated
- 2022: +**2M** campaigns in Process
- **97.6%** of vaccinators prefer NFIS to N/S
- **99.6%** of caretakers prefer NFIS to N/S
- Mean coverage over previous IPV campaign improved by **18.4%**

NIGERIA

Campaign and Routine immunization

- CDC-funded Supplemental Immunization Campaign pilot
- USAID-funded Routine Immunization Evaluation with National Public Health Care Development Agency, PATH and JHPIEGO

Somalia 2021
Polio Immunization Campaign

110,000 children immunized using PharmaJet Needle-free Delivery

PharmaJet®
Needle-Free Injection™

Needle-free Makes Pharma Products Perform Better

55+
Development Partners

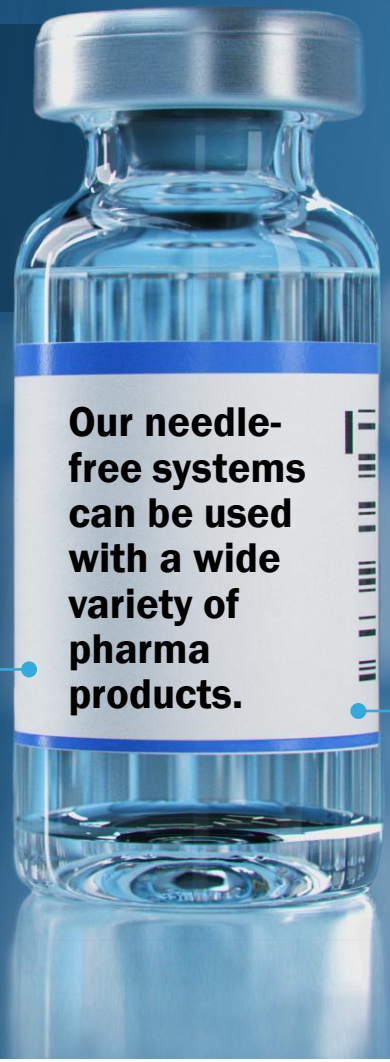
80+
Studies in Progress

65+
Completed Studies

Many Applications:
- Vaccines
- Therapeutics
- Select drug products

Any Level of Research:
- Bench testing
- Preclinical animal studies
- Clinical trials

Any Formulation:
- Viscosity up to 70 cP (mineral oil)
- Can use adjuvants and microcarriers
- Can do multiple injections per timepoint for larger doses



- Nucleic Acid
- Inactivated
- Subunit
- Live Attenuated
- Viral Vector
- Bacteria

Proven Benefits Of Needle-free Injection

IMPROVED STUDY RESULTS

Data from nucleic acid studies has repeatedly shown:

- Improved immunogenicity compared to N/S*
- Non-inferior immunogenicity to electroporation*

Significant dose savings potential

- Injector sets the dose
- Transition from a 0.5ml IM injection to a 0.1ml ID and maintain effective immunogenicity*

NO HASSLE

No needle means:

- No needle reuse or cross-contamination
- No sharps disposal

The PharmaJet systems are user friendly & quick to learn

HIGH ACCEPTABILITY

87% of Healthcare Workers prefer needle-free*

- No needle-stick injuries
- ID jet injection is easier than the Mantoux technique

93% of Patients & Caregivers prefer needle-free*

- No needle-phobia, improving the patient/caregiver experience
- Needle-free is more acceptable than electroporation

COMMERCIAL SUCCESS

Ideal for mass vaccination campaigns in both urban & rural settings

More cost effective than N/S*

Differentiation in the marketplace

Improved vaccine compliance

*Supporting data available by request

Publications with PharmaJet Needle-free Injection

RESPIRATORY VIRUSES

COVID-19	Phase 1/2
Influenza	Phase 1/2, Phase 4
RSV	(confidential data only)
Equine Influenza	

ARBOVIRUSES

Zika	Phase 1
Dengue	Phase 1b
VEEV	

HANTAVIRUSES

ANDV	
DOBV	
HTNV	
PUUV	
SEOV	
SNV	

OTHER VIRUSES

Hepatitis B	
HIV	(confidential data only)
MMR	Phase 4
Polio	Phase 3/4, Phase 4
Pox	Phase 2
PRRSV	
Rabies	Phase 1

CANCER

Canine Cancer	(confidential data only)
HPV	Phase ?
Lymphoma	Phase 1
Solid Tumors	Phase 1

OTHER APPLICATIONS

Atherosclerosis	
Brucellosis	(confidential data only)
Canine Allergy	(confidential data only)

Injectable Type

- DNA
- RNA
- Inactivated
- Bacteria
- Live Attenuated
- Subunit

Preclinical Animal Model

- Mouse
- Rat
- Hamster
- Guinea Pig
- Rabbit
- Dog
- NHP
- Sheep
- Pig
- Cow
- Horse

PIPELINE

PRECLINICAL ANIMAL STUDIES

RESPIRATORY VIRUSES

- COVID-19 (15 studies)
- Influenza (4 studies)
- Pandemic Influenza
- Swine Influenza

ARBOVIRUSES

- Crimean Congo Hemorrhagic Fever
- Yellow Fever
- VEEV
- Zika

OTHER VIRUSES

- Hantaviruses
- Hepatitis B
- HIV / SIV (3 studies)
- Marburg Virus
- PRRSV
- Smallpox

CANCER & OTHER

- Canine Cancer
- Multiple Cancers (2 studies)
- Alzheimer's

CLINICAL TRIALS WITH PHARMAJET NFIS

	PHASE 1	PHASE 2	PHASE 3
RESPIRATORY VIRUSES			
COVID-19	7	1	1
Influenza	1		
ARBOVIRUSES			
Zika		1	
HANTAVIRUSES			
Andes Virus	1		
Hantaan/Puumala		1	
OTHER VIRUSES			
HIV & HPV	2		
CANCER			
Breast Cancer	1		
Multiple Cancers	3		
Lymphoma	1		
Melanoma		1	
Leukemia		1	
Neoantigen		2	
HPV		1	
Lung Cancer		1	
OTHER APPLICATIONS			
Alzheimer's	1		
Vitiligo	1		
Bleeding Disorders	1		

PARTNER DATA

Transduction Efficiency

DNA vaccine
Intradermal (Tropis)
Swine
PRRSV

INRA

Antibody Response

DNA vaccine
Intramuscular (Stratis)
Phase 1 Clinical
Zika

NIH

EUA in India

Plasmid DNA vaccine
Intradermal (Tropis)
Phase 3 Clinical
COVID-19

zydus
Dedicated To Life

Antibody Response

MVA-vectored vaccine
Buccal & Sublingual (Tropis)
Rhesus macaques
COVID-19

Heterologous Prime Boost

DNA vaccine
Intramuscular (Stratis)
Phase 1 Clinical
Influenza

NIH

T Cell Immunogenicity

dbDNA™ Vector
Intradermal (Tropis)
Minipigs
Influenza

TOUCHLIGHT

Passive Immunotherapy

DNA LNP vaccine
Intramuscular (Stratis)
Rabbit, NHP, Cow
Andes & Zika

Strong T Cell Response

DNA therapeutic
Intramuscular (Stratis)
Phase 1/2a Clinical
HPV Cancerous Lesions

nykode
therapeutics

ZyCoV-D Vaccine Delivered Exclusively via Tropis

100% protection against moderate and severe COVID-19

COMPANY: Zydus Lifesciences

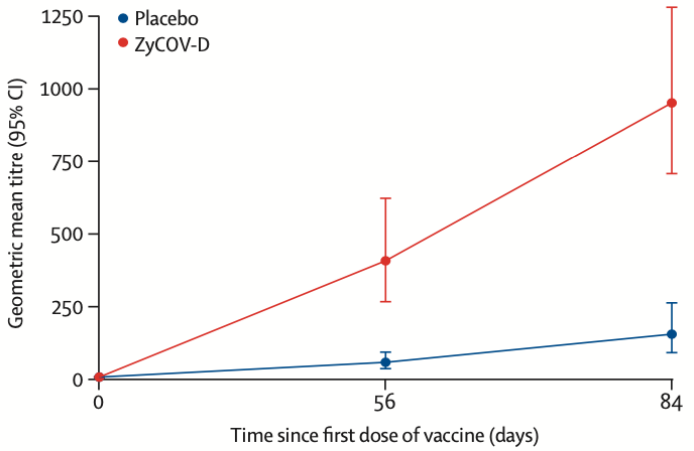
INJECTATE: COVID-19 DNA Vaccine

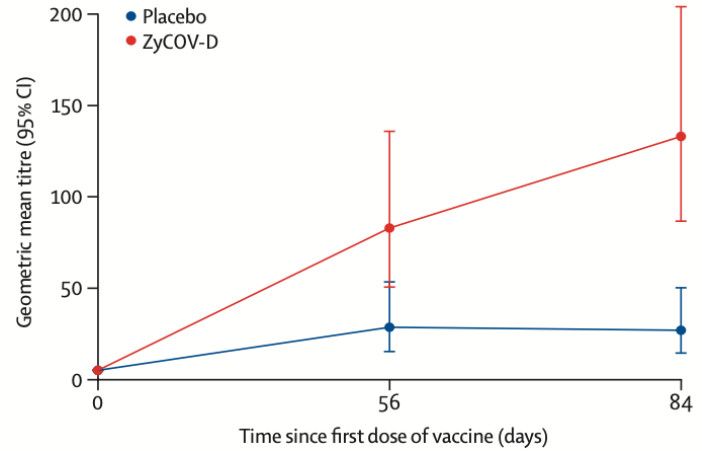
STUDY: Phase 3 Trial

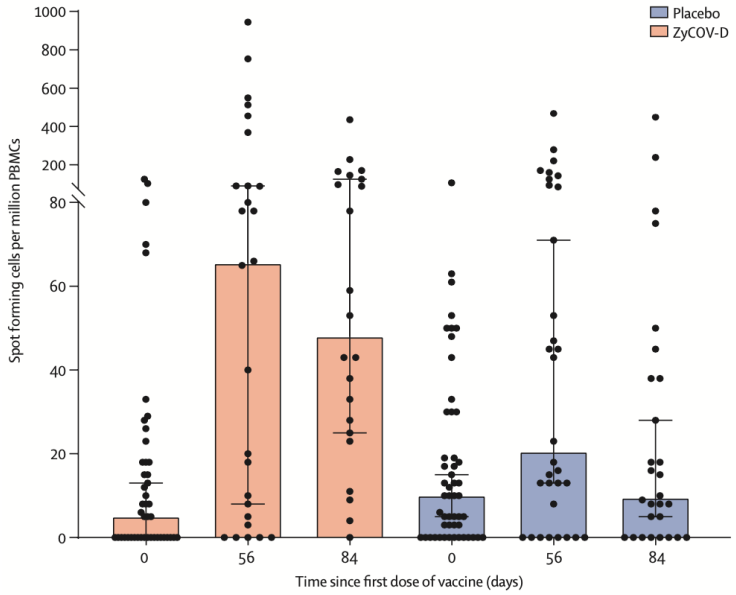
ROUTE: Intradermal with Tropis

STATUS: EUA Roll-out in India

- ✓ **Safe and well-tolerated**
- ✓ **Significantly high immunogenicity**
  - Anti-spike binding and neutralizing antibodies
  - T cell response (IFNg)
  - Higher in the 12-17 yr old group
- ✓ **Efficacious**
  - 100% protection against severe/moderate COVID-19
  - 65% protection against mild disease
  - Effective against Delta VOC







zydus
Dedicated To Life

Khobragade, et al (2022). *Efficacy, safety, and immunogenicity of the DNA SARS-CoV-2 vaccine (ZyCoV-D): the interim efficacy results of a phase 3, randomised, double-blind, placebo-controlled study in India.* https://doi.org/10.1016/S0140-6736(22)00151-9

Emerging/Re-Emerging Infectious Disease Vaccines

Effectiveness in multiple animal models

INSTITUTION: **USAMRIID**

INDICATION: **Andes or Zika Virus**

INJECTATE: **DNA-LNP Vaccine**

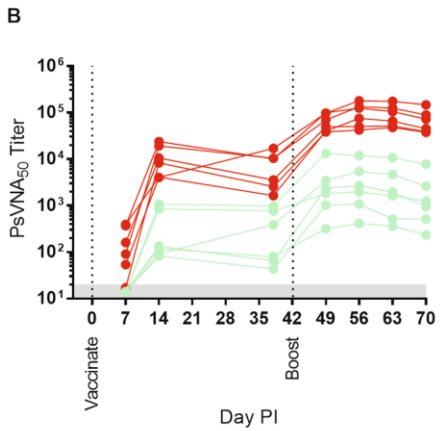
SPECIES: **Rabbit, NHP, and Cow**

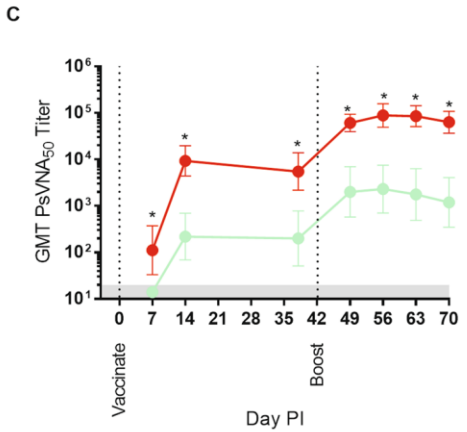
ROUTE: **Intramuscular with Stratis**

- ✓ **Rabbits/ANDV:** Rapid, dose-dependent neutralizing antibody response
  - DNA-LNP faster, higher, less variable
- ✓ **NHP/ANDV:** DNA-LNP more immunogenic compared to un-formulated
- ✓ **Tc Cow/Zika:** Successful hyperimmunization to produce polyclonal human IgG for use as passive immunotherapy

A

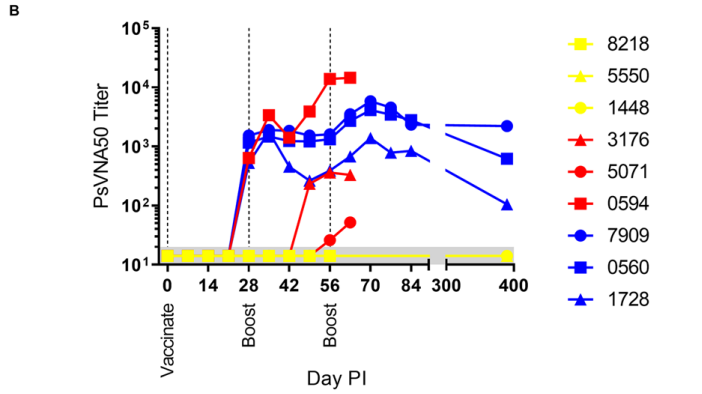
Group	Color	DNA	Dose	LUNAR	Prime	Boost	n
1		AND-M	0.1 mg	YES	Day 0	Day 42	6
2		AND-M	0.1 mg	NO	Day 0	Day 42	6





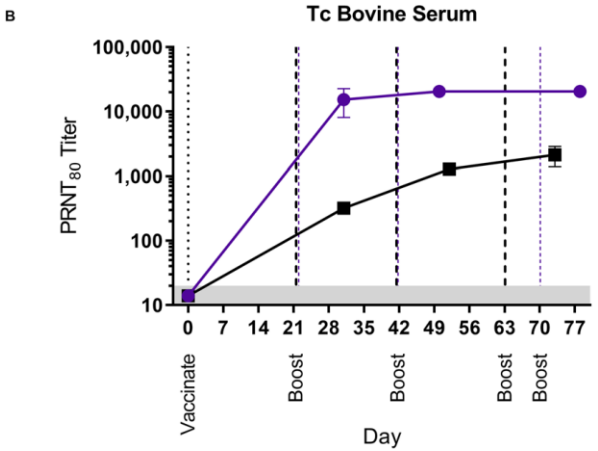
A

Group	Color	DNA	Dose	LUNAR	Prime	Boost	Boost	n
1		AND-M	0.1 mg	NO	Day 0	Day 28	-	3
2		AND-M	0.1 mg	YES	Day 0	Day 28	-	3
3		AND-M	2.0 mg	NO	Day 0	Day 28	Day 56	3



A

Group	Symbol Color	Vaccine	Dose	LUNAR	Vaccination Schedule	Reference
1		Zika DNA	1.2 mg	YES	0, 22, 42, 70	NA
2		Zika DNA	12 mg	NO	0, 21, 42, 63	15



Mucker, EM, et al (2020). *Lipid Nanoparticle Formulation Increases Efficiency of DNA-Vectored Vaccines/Immunoprophylaxis in Animals Including Transchromosomic Bovines.* https://doi.org/10.1038/s41598-020-65059-0

VB10.16 HPV16 Cancer DNA Immunotherapy

Strong T cell responses with significant correlation to lesion size regression

COMPANY: Nykode Therapeutics

INDICATION: HPV Cancerous Lesions

INJECTATE: DNA-based Immunotherapy

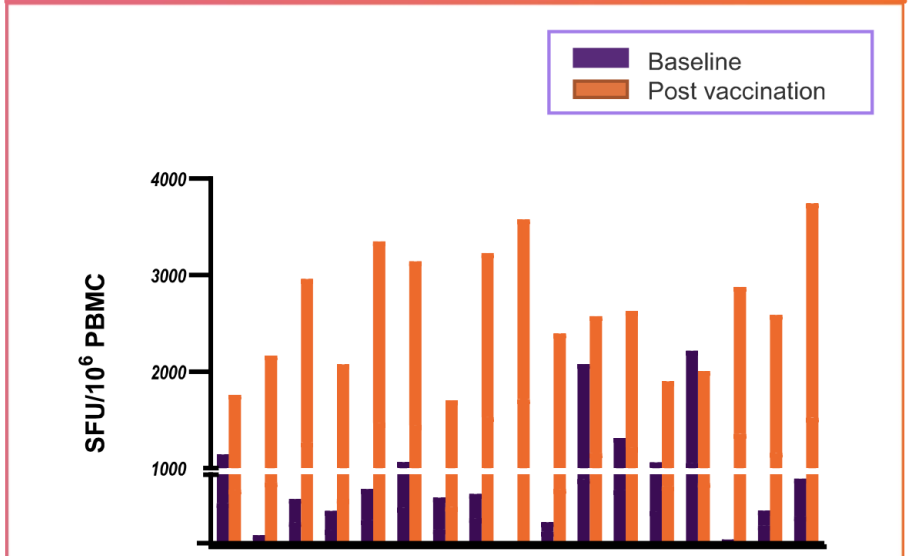
ROUTE: Intramuscular with Stratis

STATUS: Phase 1/2a Clinical Trial Complete

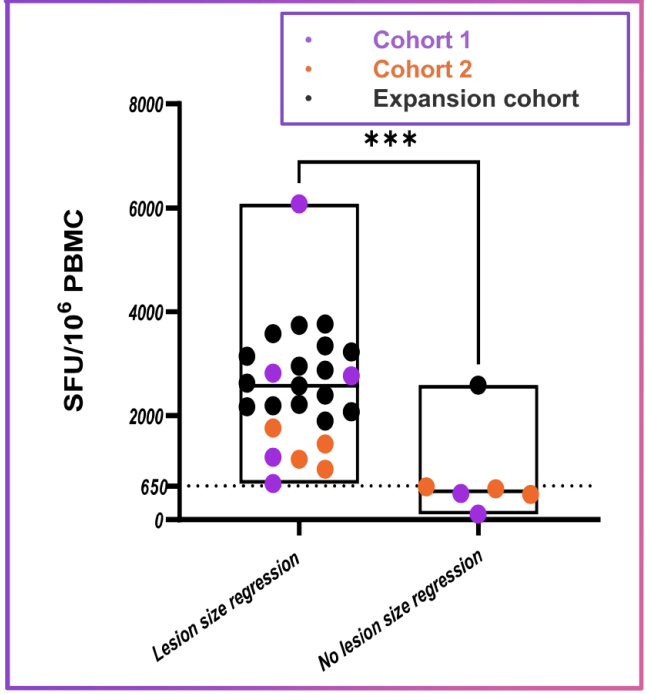
- ✓ **All** patients in expansion cohort produced a **strong HPV16-specific T cell response**
- ✓ Highly significant **correlation between vaccine-induced T cell responses and lesion size regression** in all cohorts

nykode therapeutics

STRONG HPV16-SPECIFIC T CELL REPSONSES IN ALL PATIENTS IN THE EXPANSION COHORT



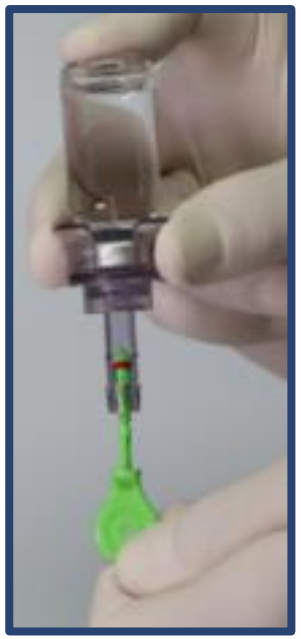
LESION SIZE REGRESSION CORRELATES WITH HPV-16 SPECIFIC RESPONSES



Tropis workflow

1. Prepare Injector

2. Fill Syringe



3. Load Injector

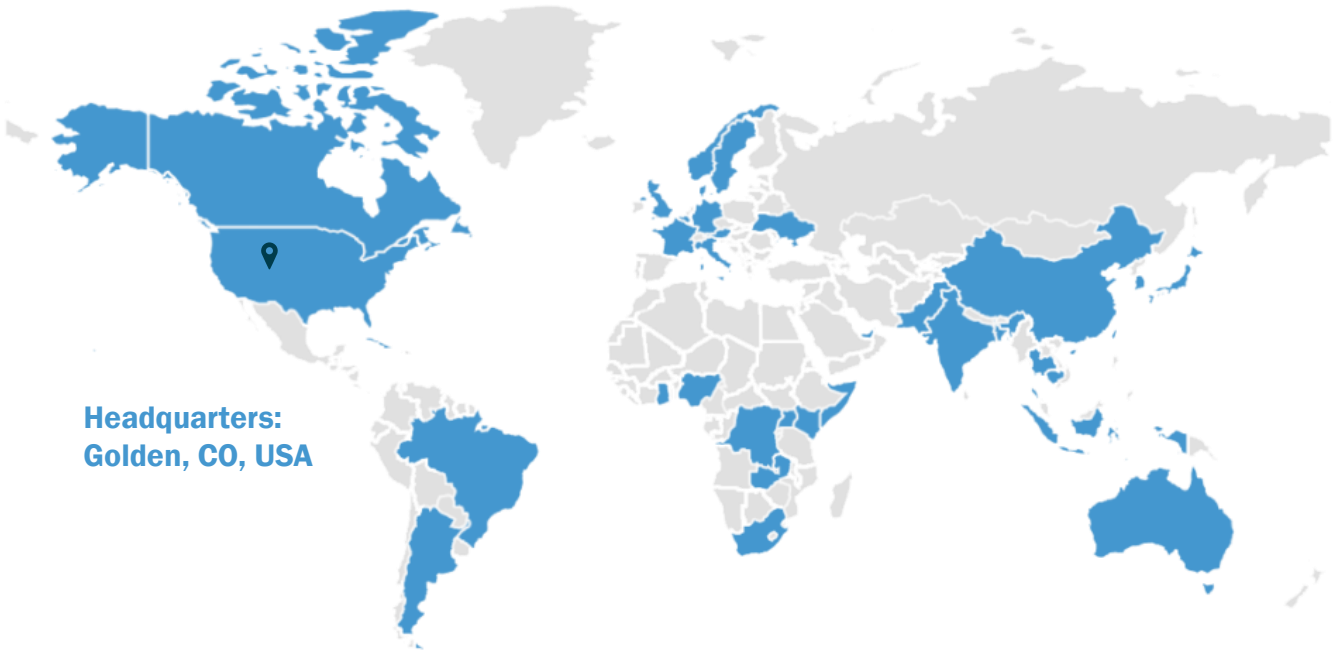
4. Give the injection

Workflow is comparable to needle-syringe.

Most users are self- or web-educated within 20 minutes

Partnership You Can Trust

Enabling Greater Access to Life-Improving Pharmaceuticals with Needle-free Injection Systems



PharmaJet has commercial and development partnerships in the countries highlighted above.

REGULATORY CLEARANCES

PharmaJet's Needle-free Injection Systems are validated commercial devices, having several regulatory clearances across the globe.

Tropis®

REGISTRATIONS:

- US FDA Master File
- European Union
- WHO/PQS
- Brazil
- Vietnam
- Israel
- India
- Kenya
- Ghana

Stratis®

REGISTRATIONS:

- US FDA (510k)
- European Union
- WHO/PQS
- Brazil
- Vietnam
- Israel
- South Korea
- Colombia

PharmaJet's needle-free injection devices are the first ***and only*** to achieve **World Health Organization** standards for **Pre-qualification (PQS).**

Partnering with PharmaJet

STRATEGIC ALLIANCES WITH:

- Academia
- Government
- Pharmaceutical
- Biotechnology

When you choose needle-free for your study, you have the PharmaJet team at your back.

We provide support from early development to large scale-ups, and our experienced clinical and regulatory teams will ensure that the implementation of needle-free is simple.

1 Establish Partnership

- Determine your needs & goals
- Share best practices & data from previous collaborations
- Execute MTA

2 Development & Support

- Learn how to use the devices with hands-on training sessions
- Get support with study design & site initiation

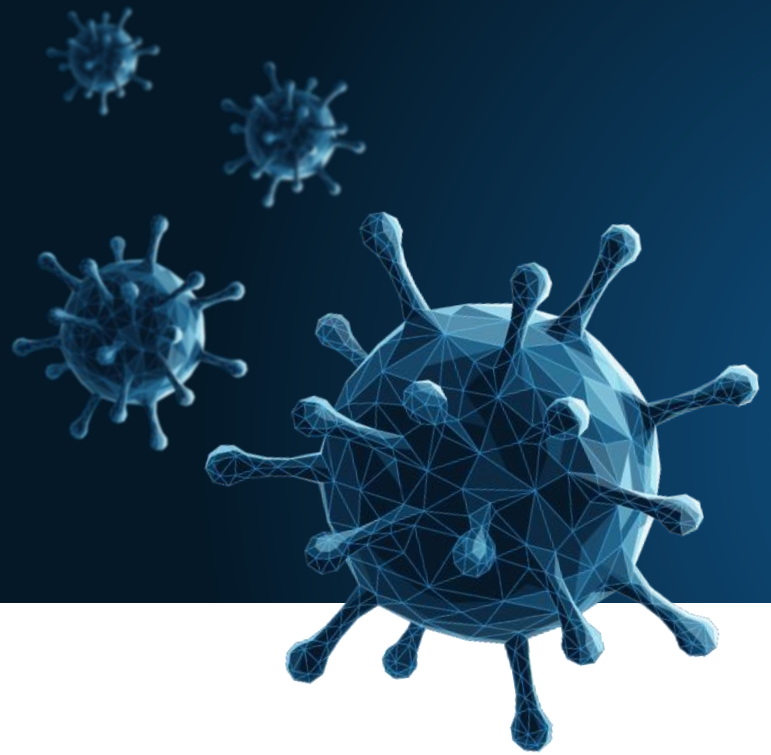
3 Planning & Proposal

- Receive assistance with funding
- Use our dossier for existing regulatory clearances
- Get support with IND application

4 Commercialization

- Receive technical support & training
- Collaborate on data publication
- Get support with marketing and PR

Questions



THANK YOU

PharmaJet®

Needle-Free Injection™

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