ORAGENICS

World Vaccine Congress Washington

April 18-22, 2022
NYSE: OGEN

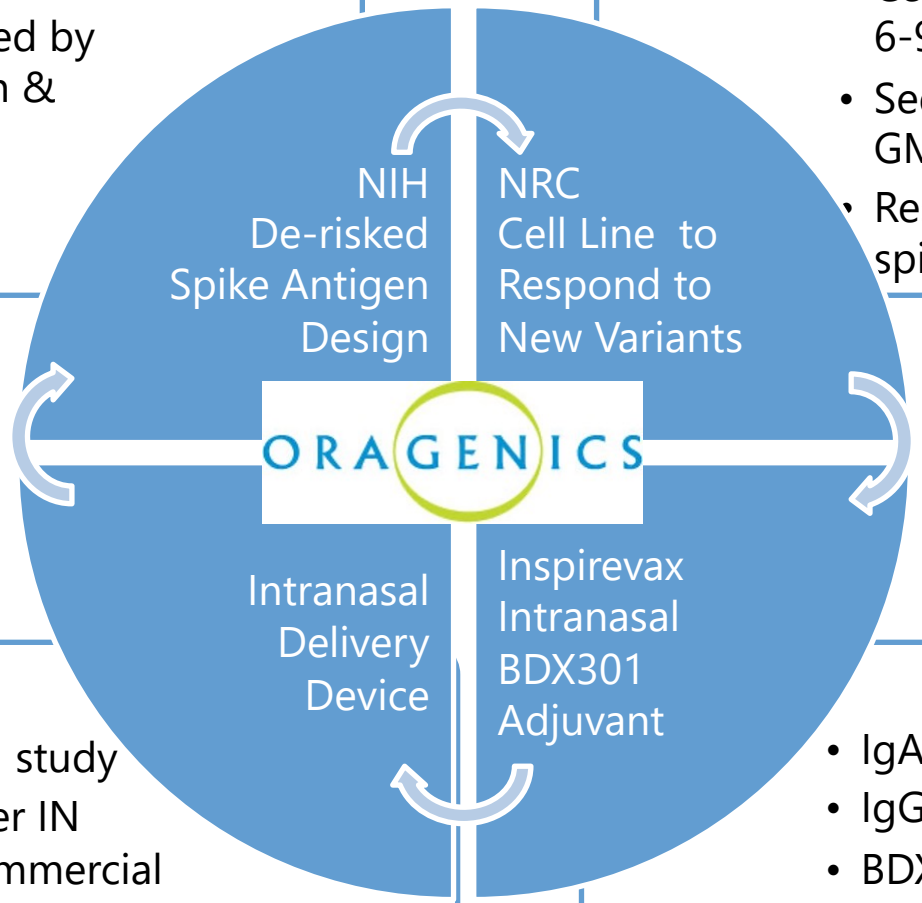
Oragenics Summary

- **Lead Asset: NT-CoV2-1**
  - Licensed from NIH – two-proline substitution of SARS-CoV-2 spike protein
- **NT-CoV2-1 Intranasal Vaccine Differentiation and Advantages**
  - Patient-friendly, needle-free administration
  - May reduce virus transmission at source of infection (mucosal nasopharyngeal surfaces)
  - Protein subunit-based intranasal vaccine approach versus live viral intranasal vaccine
  - Small intranasal competitive landscape, others need to prove new vector safety
  - NRC Platform allows rapid production of cell lines in 6-8 weeks
- **Animal Studies Demonstrated High Immunogenicity & Strong Neutralizing Activity**
  - Intranasal formulation led to high IgG and IgA anti-spike protein titers in blood and lungs of mice
  - Undetectable viral loads in hamster nasal turbinates and lungs; significant reduction of weight loss
  - Prevented the cellular binding of the viral Spike protein based on the ancestral reference strain
- **Ongoing IND-enabling GLP-Tox Study in Rabbits, Phase 1 expected this year**

NT-CoV2-1 Combines Four Technologies

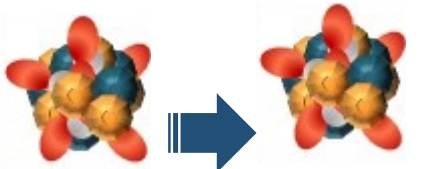
- Licensed "2P" substitution used by Pfizer/BioNTech & Moderna

- Cell lines 6-8 weeks vs 6-9 months
- Sequence -> Ph1 GMP DS in 12 wks
- Resistin-trimerized spike protein



- Device for Ph1 study
- Assessing other IN devices for commercial use

- IgA Ab (mucosal)
- IgG Ab (systemic)
- BDX adjunct tested in over 2000 subjects



BDX300 Adjuvant

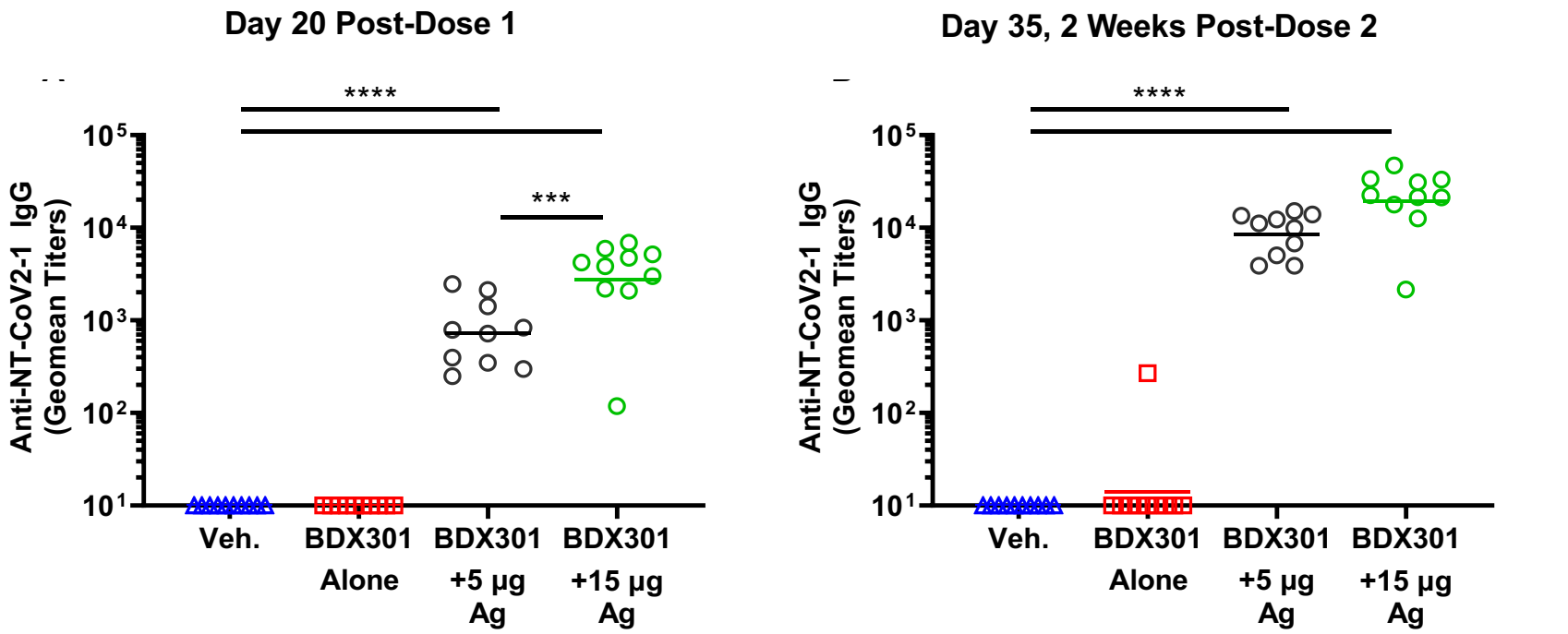
CHP+LP GSK flu program:

BDX301 Adjuvant

Improved Purified proteosome with lipo-oligopolysaccharides

Hamster Study Results – NRC/Oragenics

Intranasal formulation led to high IgG anti-spike protein titers

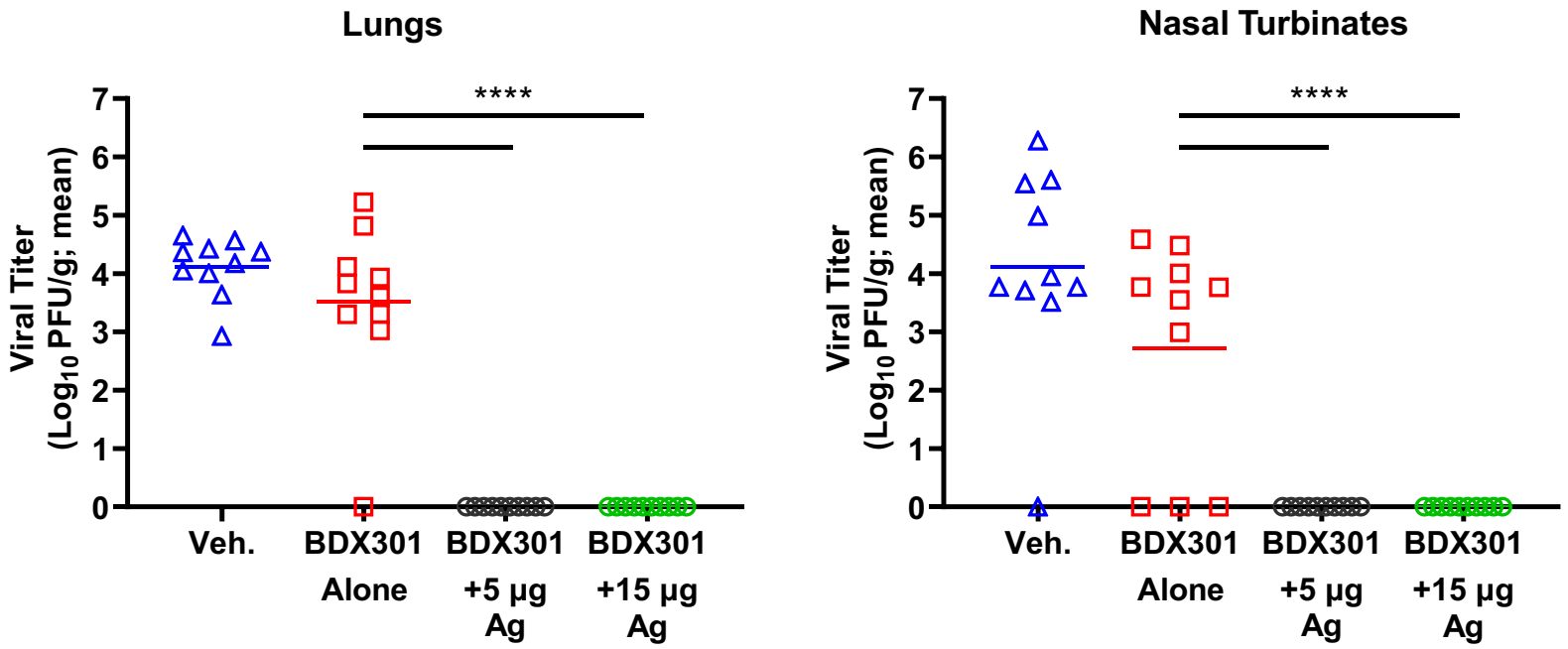


Anti-Spike IgG titers induced by SmT1v3 antigen and BDX301 adjuvant formulations in hamsters. Syrian Golden hamsters (n=10/group) were immunized twice on Days 0 and 21 with PBS (vehicle control, Veh.) with BDX301 (5 µg) with or without SmT1v3 (5 µg or 15 µg) via the intranasal route. Serum collected on Day 20 and Day 35 were analyzed by ELISA to determine the levels of antigen-specific IgG titers. Antibody titers are expressed as a reciprocal value of the serum dilution calculated to generate an OD450 = 0.2. For statistical analysis, antibody titers were log-transformed and then analyzed by a one-way ANOVA with Tukey's multiple comparisons test. ***: $p<0.001$, ****: $p<0.0001$. SmT1v3 antigen is based on the original Wuhan sequence incorporating the NIH 2P substitution and the NRC resistin trimerization.

Stark et al., bioRxiv, March 2, 2022, https://doi.org/10.1101/2022.03.02.482651

Hamster Study Results – NRC/Oragenics

Intranasal formulation led to undetectable viral loads



Efficacy of SmT1v3 and BDX301 formulations against SARS-CoV-2 viral challenge in hamsters. Syrian Golden hamsters were immunized twice on Days 0 and 21 with PBS (vehicle control, Veh.) delivered intramuscularly or BDX301 (5 µg) with or without SmT1v3 (5 or 15 µg) via the intranasal route. On Day 42 all hamsters were challenged with 1 x 10^5 PFU of SARS-CoV-2. On Day 47, hamsters were euthanized, and viral titers were quantified in lung and nasal turbinates by plaque assay. For statistical analysis, a one-way ANOVA with Tukey's multiple comparisons test was performed. ****: $p<0.0001$. SmT1v3 antigen is based on the original Wuhan sequence incorporating the NIH 2P substitution and the NRC resistin trimerization.

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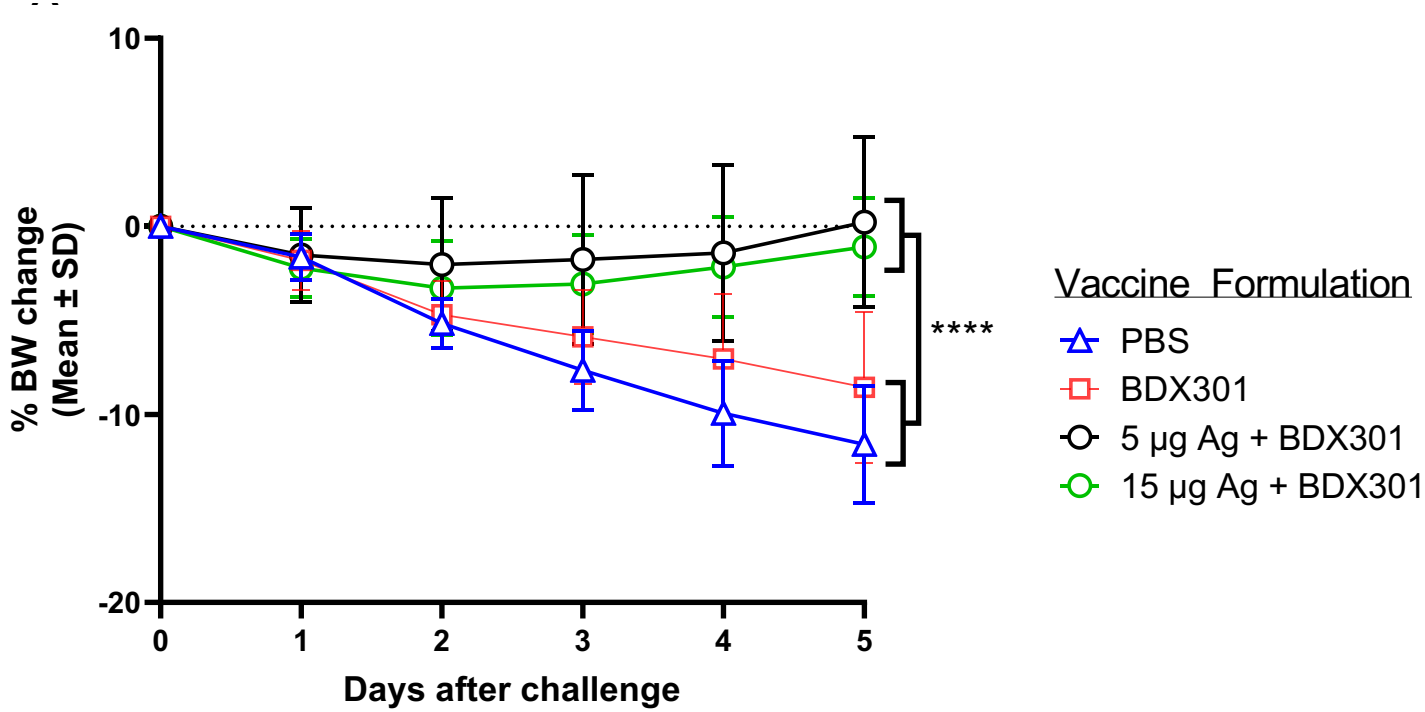
Hamster Study Results – NRC/Oragenics

Intranasal formulation decreased body weight loss



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Intranasal COVID-19 Vaccines

Potential benefits of intranasal COVID vaccines

- **Intranasal vaccines may address limitations of current vaccines**
  - Waning efficacy requiring third (and fourth) doses for new VOCs
  - Transmission remains a concern due to high nasopharyngeal viral loads
    - Recent study in healthcare workers in Israel during Omicron VOC shows limitations of mRNA vaccines[1]
    - 4th dose efficacy against any infection was 30% Pfizer/BioNTech vaccine (95% CI -9% to 55%) and 11% for the Moderna vaccine (95% CI -43% to 44%)
    - Authors conclusion: "next generation vaccines may be needed to provide better protection against infection with highly transmissible future variants"[2]
  - Intranasal vaccines could reduce nasopharyngeal viral loads vs. IM vaccines
- **Intranasal vaccines offer needle-free option**
  - 1 in 4 adults and 2 out of 3 children have strong needle fears[3]
  - 10% of people may delay COVID-19 vaccine due to fear of needles[3]

1. Regev-Yochay et al., NEJM, March 16 2022, https://doi.org/10.1056/NEJMc2202542
2. Regev-Yochay et al., medRxiv, posted Feb 15 2022, https://doi.org/10.1101/2022.02.15.22270948
3. www.cdc.gov/childrensmentalhealth/features/needle-fears-and-phobia.html

Appendix

COVID-19 Vaccine Commercial Analysis

Intranasal vaccine pipeline is limited

Intranasal Vaccine Candidates vs. Oragenics' NT-CoV2-1

Organization	Organization Type	Vaccine Type	Stage	Comments
Precision Viralogics/ Bharat Biotech	US biotech/Indian manufacturer	Live chimpanzee adenovirus vector	Phase 2	Indian-made vaccines unlikely to be approved in US/EU
Codagenix/Serum Institute of India	US biotech/Indian manufacturer	Live attenuated SARS-CoV-2 virus	Phase 1	Hard to establish safety of live, attenuated SARS-CoV-2 vaccine
Oxford University/ Astra Zeneca	UK university/ Big Pharma	Live chimpanzee adenovirus vector	Phase 1	Known AEs (blood clots) may hinder approval & acceptance in US/EU
Meissa Vaccines	US private biotech	Live respiratory syncytial virus vector	Phase 1	Need to establish safety of new viral vector
CyanVac	US private biotech	Live parainfluenza-5 virus vector	Phase 1	Need to establish safety of new viral vector
Mt. Sinai, NY	US academic medical center	Live Newcastle disease viral vector	Phase 1	Need to establish safety of new viral vector
Oragenics	*US public biotech*	*Protein subunit + BDX-301 adjuvant*	*Late preclinical*	*Non-viral intranasal vaccine candidate*
Intravacc	*Netherlands private CDMO*	*Protein subunit + OMV adjuvant*	*Late preclinical*	*Non-viral intranasal vaccine candidate*

From WHO COVID-19 Vaccine Tracker: www.who.int/teams/blueprint/covid-19/covid-19-vaccine-tracker-and-landscape, dated March 8, 2022
List excludes 4 vaccine candidates from Cuba, Hong Kong University, Iran and Mexican veterinary vaccine company.

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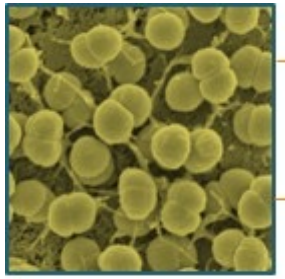
BDX301 Intranasal Adjuvant

Positive clinical data for adjuvant family & improved processes



Neisseria meningitidis

DETERGENT MEDIATED EXTRACTION

PROTEOSOMES (BDX200)
OUTER MEMBRANE PROTEIN
(DETERGENT SOLUBLE)

VACCINE FORMULATED BY MIXING WITH ANTIGEN AND REMOVING DETERGENT BY DIALYSIS

BDX200 VACCINE

10 intranasal flu vaccine studies in 2,030 subjects performed with BDX200 by ID Biomedical (FluInsure)

Improvements made during GSK ownership to make more soluble

V2 (BDX300)
OMP + LPS
(WATER SOLUBLE)

GSK de-prioritized their flu vaccine programs in 2008 and BDX300 did not enter clinical studies

Further process improvements to remove detergent impurities

BDX301 Adjuvant

Purified proteosome with lipo-oligopolysaccharides

WRAIR
Walter Reed Army Institute of Research
Soldier Health • World Health

→ Intellivax
Spin-out based on George Lowell's work at WRAIR

Acquired 2001 → ID BIOMEDICAL

Acquired 2005 → gsk

Spun out 2015 → biodextris
BRINGING INNOVATION TO LIFE

Spun out 2021 → Inspirevax
Owner of BDX301 adjuvant

Oragenics Team

- **Terry Cochrane – CMC**
  >20 years biopharmaceutical development and GMP manufacturing experience
- **Tim Cooke PhD, MBA – Commercial**
  >30 years vaccine industry experience at Merck, CEO NovaDigm & Mojave Therapeutics, COO AVANT Immunotherapeutics, National Vaccine Advisory Committee 2015-2023, CARB-X Advisory Board, WHO Tech Advisory Group for AMR Vaccines
- **Marty Handfield PhD – Preclinical/Tox**
  13 years as SVP Research, Oragenics & Associate Professor, U. Florida
- **Consultant – CMC**
  >30 years vaccine industry experience at Merck, CSO NovaDigm Therapeutics, extensive experience in global health vaccine projects with Gates Foundation and PATH
- **Robert House PhD – USG Contracts**
  >30 years industry experience, President DynPort Vaccines, SVP Ology Bioservices, Covance, IITRI
- **Florian Schödel MD – Clinical/Regulatory**
  >30 years academic, government & vaccine industry experience, including Max Planck, WRAIR, INSERM and Merck, provides clinical/regulatory support for multiple vaccine companies, including COVID-19 vaccine programs
- **David Zarley PhD– Preclinical/Tox & Clinical Assays**
  >30 years vaccine industry experience at Lederle/Wyeth/Pfizer, including development of the intranasal FluMist vaccine, consulted for Noachis Terra on their COVID-19 vaccine