THE FUTURE OF VACCINES

JEFFERIES CONFERENCE

JUNE 2016
This presentation includes forward-looking statements that involve risks, uncertainties and other factors, many of which are outside of our control that could cause actual results to differ materially from the results discussed in the forward-looking statements. Forward-looking statements include statements regarding our short-term objectives and opportunities, financial expectations for the full year and financial preparedness as of year end, as well as statements concerning our plans, objectives, goals, future events, performance and/or other information that is not historical information. All such forward-looking statements are expressly qualified by these cautionary statements and any other cautionary statements which may accompany the forward-looking statements. We undertake no obligation to publicly update or revise forward-looking statements to reflect subsequent events or circumstances after the date made, except as required by law.
MULTIPLE LAYERS OF VALUE

1 approved product
7 active programs

2 focus areas
Infectious Disease & Oncology

3 Phase 3 Products
Multiple near-term milestones

Validated Platform Technology
(NIH, BARDA, BMS, Janssen)

Expertise in T-Cell Stimulation
& Antibody Response

Broad Pipeline
& Late-Stage Candidates

$1.2B in US government contracts
$950M in revenues over past 10 years
$975M BMS deal - PROSTVAC
$358M Janssen deals - Ebola and HPV

Strong Revenue Base to Re-Invest in Clinical Pipeline
FINANCIAL OUTLOOK

USD million

<table>
<thead>
<tr>
<th></th>
<th>3m 2016</th>
<th>FY2016E</th>
</tr>
</thead>
<tbody>
<tr>
<td>Revenue</td>
<td>4</td>
<td>153</td>
</tr>
<tr>
<td>EBIT</td>
<td>(23)</td>
<td>0</td>
</tr>
<tr>
<td>Cash preparedness</td>
<td>209</td>
<td>291</td>
</tr>
</tbody>
</table>

Cash preparedness includes cash, cash equivalents, investments in securities and the aggregate amount of undrawn credit lines.

All numbers are approximate
USD/DKK = 6.83
## CLINICAL PIPELINE

<table>
<thead>
<tr>
<th>PRODUCT CANDIDATE INDICATION</th>
<th>COMMERCIAL RIGHTS</th>
<th>PRIMER / BOOSTER</th>
<th>PRECLINICAL</th>
<th>PHASE 1</th>
<th>PHASE 2</th>
<th>PHASE 3</th>
<th>APPROVED</th>
<th>STATUS / EXPECTED MILESTONES</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Infectious Disease</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IMVAMUNE / IMVANEX (LIQUID FROZEN)</td>
<td>Smallpox</td>
<td>MVA-BN MVA-BN</td>
<td>Approved in Canada and the European Union</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Approved in Canada and the European Union</td>
</tr>
<tr>
<td></td>
<td>Smallpox</td>
<td>MVA-BN MVA-BN</td>
<td>Phase 3 in US (non-inferiority)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Complete enrollment in 2017</td>
</tr>
<tr>
<td>IMVAMUNE (FREEZE DRIED)</td>
<td>Smallpox</td>
<td>MVA-BN MVA-BN</td>
<td>Phase 2 complete</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Manufacturing validation</td>
</tr>
<tr>
<td>MVA-BN Filo</td>
<td>Ebola / Marburg</td>
<td>Advac (a) MVA-BN</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Data from multiple trials in 2016</td>
</tr>
<tr>
<td>MVA-BN RSV</td>
<td>RSV</td>
<td>MVA-BN MVA-BN</td>
<td>Fully enrolled</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Phase 1 trial data in 1H16</td>
</tr>
<tr>
<td>HPV Vaccine</td>
<td>HPV</td>
<td>Advac (a) MVA-BN</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Deal signed in December 2015</td>
</tr>
<tr>
<td><strong>Cancer Immunotherapy</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PROSTVAC mCRPC</td>
<td>Vaccinia Fowlpox</td>
<td>PROSPECT fully enrolled</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Three interim analyses likely starting in 1Q16 with top-line data in 2017</td>
</tr>
<tr>
<td>Localized Prostate Cancer</td>
<td>Vaccinia Fowlpox</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• NCI enrolling Phase 2 trial</td>
</tr>
<tr>
<td>Localized Prostate Cancer (neoadjuvant)</td>
<td>Vaccinia Fowlpox</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• NCI Phase 2 trial data in 2016</td>
</tr>
<tr>
<td>Non-Metastatic Castration Sensitive Prostate Cancer</td>
<td>Vaccinia Fowlpox</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• NCI enrolling Phase 2 trial</td>
</tr>
<tr>
<td>mCRPC</td>
<td>Vaccinia Fowlpox</td>
<td>+ XTandi (enzalutamide)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• NCI enrolling Phase 2 trial</td>
</tr>
<tr>
<td>Metastatic Castration Sensitive Prostate Cancer</td>
<td>Vaccinia Fowlpox</td>
<td>+ ADT and docetaxel</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• NCI enrolling Phase 2 trial</td>
</tr>
<tr>
<td>Non-Metastatic Prostate Cancer</td>
<td>Vaccinia Fowlpox</td>
<td>+ XTandi (enzalutamide)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• NCI Phase 2 trial data in 1H16</td>
</tr>
<tr>
<td>Prostate Cancer</td>
<td>Vaccinia Fowlpox</td>
<td>ipilimumab</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• NCI Phase 1 trial enrollment complete</td>
</tr>
<tr>
<td>CV 301</td>
<td>Bladder Cancer</td>
<td>Vaccinia Fowlpox</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• NCI enrolling Phase 2 NCI trial</td>
</tr>
<tr>
<td>MVA-BN Brachyury Solid Tumors</td>
<td>MVA-BN MVA-BN</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Phase 1 data reported in 4Q15</td>
</tr>
</tbody>
</table>

(a) An adenovirus primer from Janssen.
(b) BMS would have complete commercial rights to PROSTVAC, regardless of treatment setting, should they exercise their licensing agreement.
(c) Anticipated transition to MVA primer.
(d) Anticipated transition to Fowlpox booster.
COMMERCIAL MANUFACTURING CAPABILITIES

Commercial Production Facility
• Inspected by the EMA and the FDA
• 28M doses of IMVAMUNE delivered to US national stockpile
• Over 2M doses of MVA-BN Filo (Ebola) delivered to Janssen

Poxvirus Manufacturing Expertise
• Commercial partnerships in place with Janssen & BMS
• All manufacturing performed by BN
• Company has developed IP and extensive know-how in the production of poxvirus based vaccines

Multi-Product Facility
• Highly scalable, fully integrated, reduces dependency on sub-contractors
• Fill/Finish established to support commercial launch of PROSTVAC
• Production of all clinical trial material
PROSTVAC

- prostate cancer
- Partnered with Bristol-Myers Squibb
- Phase 3 fully enrolled
- Phase 3 top-line data expected in 2017
- Multiple clinical studies being advanced in earlier stages and in combination regimens

IMVAMUNE

- smallpox vaccine
- Approved in EU & Canada
- 28 million doses delivered to US
- $233 million in bulk vaccine orders bridging to next-generation freeze-dried vaccine
- Recurrent orders from Canada

Janssen

- partnership
- 2 license agreements in Ebola & HPV
- Moved Ebola vaccine from preclinical to Phase 3 in 9 months
- 2 million doses of Ebola vaccines produced

Pipeline

- projects
- Advancing clinical development of RSV vaccine in elderly & children
- Advancing development of CV-301 in combination treatment for multiple cancers
- Supporting NCI in clinical development of MVA-BN Brachyury

STRONG FOUNDATION FOR FURTHER DEVELOPMENT
IMVAMUNE PARTNERSHIP WITH THE U.S.

**IMVAMUNE® liquid-frozen**
- R&D & Supply Contracts
  - 20 million doses
  - $679m
  - 2003 - 2012
- Supply Contract
  - 8 million doses
  - $228m
  - 2013

**IMVAMUNE® freeze-dried**
- R&D Contract
  - $95m
  - 2009-2011
- Bulk Supply
  - $233m
  - 2015-2016

**Long-term stockpiling goal**
- 132 million doses

More than $1.2bn in R&D and supply contracts to-date

Stockpile Resupply
- 20 million doses
- 2015-2017
- 2020
OUR COLLABORATION WITH JANSSEN

**MVA-BN Filo (Ebola)**
License & Supply Agreement
US$ 187m

**MVA-BN HPV**
License Agreement
US$ 171m

A sustained partnership
- Janssen took almost 5% equity stake in BN upon signing Ebola deal
- Validation of our MVA-BN technology & manufacturing
- Recent publication of Ebola Phase 1 data confirms durable immune responses when combining MVA-BN and AdVac.
PROSTVAC
PRIME/BOOST PSA TARGETED “OFF THE SHELF” CANCER VACCINE

Heterologous prime/boost regimen

Vaccinia or MVA + Fowlpox

Subcutaneous administration

PSA
CEA, MUC-1
HER-2
Brachyury

Tumor antigens with epitopes enhanced for HLA binding

Prostate, lung, head & neck, bladder, colorectal, breast, ovarian and renal cancers

TRICOM
(TRIad of COstimulatory Molecules)

Enhance T-Cell activation in synergistic manner

Strengthen the anticancer immune response

Safe and well tolerated (11 clinical trials)

Injection site reactions and flu-like symptoms
PROSTVAC INDUCES AN ANTIGEN CASCADE AGAINST PROSTATE CANCER CELLS

Summary of T-cell responses from six PROSTVAC clinical trials

<table>
<thead>
<tr>
<th>Test</th>
<th>Result</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSA-Specific Immune response</td>
<td>56.7% (59/104)</td>
<td>28 days after last vaccine</td>
</tr>
<tr>
<td>Median fold increase in PSA-specific immune response</td>
<td>5X</td>
<td>PSA response 30 / 10^6 cells flu response 33 / 10^6 cells</td>
</tr>
<tr>
<td>Antigen Cascade</td>
<td>67.9% (19/28)</td>
<td></td>
</tr>
<tr>
<td>Anti-PSA Ab</td>
<td>0.57% (2/349)</td>
<td></td>
</tr>
</tbody>
</table>

PROSTVAC PHASE 3 STUDY

PROSPECT
A Randomized, Double-blind, Global Phase 3 Efficacy Trial of PROSTVAC in Metastatic Castration-Resistant Prostate Cancer

Randomization by region (N=1,297)

- **Rest of World**: 38.2% (n=333)
- **Western Europe**: 25.7% (n=497)
- **North America Oncology**: 18.4% (n=239)
- **North America Urology**: 17.7% (n=229)
- **USA, Canada**: 9.8% (n=133)

3 study arms
- **PROSTVAC + GM-CSF**
- **PROSTVAC**
- **Placebo**

Injections
- Average was **6.1 injections**\(^1\)
- Randomized Phase 2 trial (n=122) had average of **5.4 injections**\(^2\)
- An increased number of injections is expected to improve the clinical outcome for patients receiving the active drug.

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1) Subjects who have completed study treatment phase or have completed 7th dosing visit. N=1,279
2) Kantoff et al., Journal of Clinical Oncology, January 2010
First interim analysis of the PROSPECT Phase 3 study has occurred

- A recent review by the Data Monitoring Committee informed BN to “Continue the trial without modification”
- Interim 1 was an analysis of each of the active PROSTVAC arms (with or without GM-CSF) versus placebo, thus requiring at least 214 events per comparison (equals 40% of the 534 events required for final overall survival analysis)
- 2 additional interim analyses remain
- Final overall survival data anticipated in 2017

<table>
<thead>
<tr>
<th>Interim Analysis #1</th>
<th>✓</th>
<th>214 events</th>
<th>40%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interim Analysis #2</td>
<td></td>
<td>321 events</td>
<td>60%</td>
</tr>
<tr>
<td>Interim Analysis #3</td>
<td></td>
<td>427 events</td>
<td>80%</td>
</tr>
<tr>
<td>Final Overall Survival Analysis</td>
<td></td>
<td>534 events</td>
<td>100%</td>
</tr>
</tbody>
</table>
DEMONSTRATED POTENTIAL AS A COMBINATION THERAPY WITH BMS’ IPILIMUMAB

PROSTVAC Phase 2 Trial

PROSTVAC + Ipilimumab Phase 1 Trial

Patients in 10mg/kg dose cohort (N=15) reported 37.2 months median overall survival

~20% of 10mg/kg patients remain alive at 80 months

BMS to Initiate Combination Trial with a Checkpoint Inhibitor In Early 2016


ONGOING PROSTVAC STUDIES
SPAN PROSTATE CANCER DISEASE LANDSCAPE

<table>
<thead>
<tr>
<th>Disease Status</th>
<th>Treatment Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hormone dependent</td>
<td>mono (NCI), hormonal combo (NCI)</td>
</tr>
<tr>
<td>Castration resistant</td>
<td>hormonal combo (NCI), chemotherapy (BN)</td>
</tr>
<tr>
<td>Nonmetastatic</td>
<td>mono (NCI), hormonal combo (NCI)</td>
</tr>
<tr>
<td>Metastatic</td>
<td>chemotherapy, radiation therapy</td>
</tr>
</tbody>
</table>

- No pain: Hormone dependent
- Pain: Castration resistant

Tumor volume
† death
Further investigation of PROSTVAC in collaboration with BMS
- Two new investigator-sponsored trials planned for initiation

### Phase 2 (n=75)
Open label combination trial in localized prostate cancer using PROSTVAC and ipilimumab as neoadjuvant therapy.

<table>
<thead>
<tr>
<th>Randomization 1:1:1</th>
</tr>
</thead>
<tbody>
<tr>
<td>PROSTVAC</td>
</tr>
<tr>
<td>ipilimumab</td>
</tr>
<tr>
<td>PROSTVAC + ipi</td>
</tr>
</tbody>
</table>

**Sponsor:** UCSF  
Clinicaltrials.gov  
NCT02506114

### Phase 2 (n=28)
Open label combination trial in prostate cancer using PROSTVAC, ipilimumab and nivolumab as neoadjuvant therapy

<table>
<thead>
<tr>
<th>Randomization 1:1:1</th>
</tr>
</thead>
<tbody>
<tr>
<td>PROSTVAC + ipi + nivo</td>
</tr>
<tr>
<td>PROSTVAC + ipi</td>
</tr>
</tbody>
</table>

**Sponsor:** NCI
## COMMERCIAL LICENSE WITH BMS

<table>
<thead>
<tr>
<th>Milestone</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upfront payment</td>
<td>$60M</td>
</tr>
<tr>
<td>License</td>
<td>$80M</td>
</tr>
<tr>
<td>Phase 3 data</td>
<td>$50M</td>
</tr>
<tr>
<td>Data-driven milestones</td>
<td>$180M*</td>
</tr>
<tr>
<td>Regulatory milestones</td>
<td>$110M</td>
</tr>
<tr>
<td>Sales milestones</td>
<td>$495M</td>
</tr>
<tr>
<td>Tiered royalties on future sales</td>
<td>High teens up to mid-twenties</td>
</tr>
</tbody>
</table>

* Based on Phase 2 data
RSV: Respiratory Syncytial Virus

- Major cause of upper & lower respiratory tract infections in adults and children
- No approved vaccine; high unmet medical need
- Recurrent infections are common, particularly in individuals with respiratory & circulatory diseases

Serious health risk for elderly
- 177,000 hospitalizations and 14,000 deaths annually among US adults older than 65 years
- Infection rate in adults ranges between 5-10% per year, 70-80% get respiratory symptoms, 10-20% are hospitalized, and 2-8% die
- High levels of transmission in nursing homes increase disease burden in these facilities

Leading cause of infant hospitalization
- Up to 176,000 hospitalizations in the US annually in children under 5
- 1.5 million outpatient visits in the US annually in children under 5
- 90% of infants contract RSV infection by 2 years of age, infants < 6 months of age are most at risk for severe disease
MVA-BN RSV PHASE 1 DESIGN

Randomized, placebo controlled study, enrolled 63 healthy subjects. Single center: University of Kansas Hospital

<table>
<thead>
<tr>
<th>Groups</th>
<th>N</th>
<th>Age (years)</th>
<th>Vaccine</th>
<th>Dose per 0.5 ml (nominal titers)</th>
<th>Schedule (Days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>18+3</td>
<td>18-49</td>
<td>MVA-BN RSV /placebo</td>
<td>$1 \times 10^7$</td>
<td>0-28</td>
</tr>
<tr>
<td>2</td>
<td>18+3</td>
<td>18-49</td>
<td>MVA-BN RSV /placebo</td>
<td>$1 \times 10^8$</td>
<td>0-28</td>
</tr>
<tr>
<td>3</td>
<td>18+3</td>
<td>50-65</td>
<td>MVA-BN RSV /placebo</td>
<td>$1 \times 10^8$</td>
<td>0-28</td>
</tr>
<tr>
<td>Total</td>
<td>54+9</td>
<td>63</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Primary objective: Safety and reactogenicity

Secondary objective: RSV-specific immune response
- Serum: IgG, IgA, neutralizing Ab (Day 14, 28, 42, 56, 180)
- PBMCs: ELISPOT/ICS (Day 7, 14, 35, 42)
- Planned assessment of IgA memory B cells (at 6 month FU)
Safety

- No unexpected and/or serious adverse reactions
- Vast majority of events represent local and systemic reactions typical for vaccines - reported as mild to moderate and resolved rapidly without intervention (≤5 days)
- Low incidence of local and systemic reactions typical for vaccines and comparable between age groups

Immunogenicity

- Dose response and differences between age groups was observed in the immune responses
- Antibodies against RSV significantly boosted in the majority of subjects
  - 2-fold increase in both IgG and IgA in elderly
  - Boosted neutralizing antibodies against both RSV subtypes (A&B)
- T cell responses were boosted in all elderly subjects
  - 3-5 fold increase in T cell responses (F, G, N proteins & whole RSV)
  - Robust T cell response (100% to 2 pools, 67% to 3 pools, 100% to RSV)
MVA-BN RSV

• Based upon the MVA-BN vaccine vector - favorable safety profile, approved in EU & Canada and commercial manufacturing in-place

• Designed to generate a balanced antibody and T cells responses to both RSV subtypes (A&B)
  • Encodes two main surface proteins F & G
  • Encodes the G surface protein from both RSV subtype A&B - poor cross reactivity between RSV subtypes
  • Encodes two highly conserved internal RSV proteins (N & M2) - good inducers of T cell responses

Construct was designed for a balanced immune response to minimize the risk of enhanced disease & encourage cross strain reactivity (protection against both RSV subtypes)
MORE TRANSGENES INCREASE THE PROTECTIVE EFFICACY OF RSV VACCINES

Improved efficacy by multi-antigen vaccine in the sensitive RT-qPCR

RSV in the lungs (L gene copies)

<table>
<thead>
<tr>
<th>Condition</th>
<th>RSV Copies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-vaccinated</td>
<td>$10^7$</td>
</tr>
<tr>
<td>RSV</td>
<td>$10^6$</td>
</tr>
<tr>
<td>MVA-BN G</td>
<td>$10^5$</td>
</tr>
<tr>
<td>MVA-BN F</td>
<td>$10^4$</td>
</tr>
<tr>
<td>MVA-BN FG</td>
<td>$10^3$</td>
</tr>
<tr>
<td>MVA-BN-RSV</td>
<td>$10^2$</td>
</tr>
</tbody>
</table>

T cell responses in the spleen of mice

- M2-specific
- G-specific
- F-specific

F: fusion protein of RSV
G: glycoprotein of RSV
MVA-BN-RSV: encodes F, G (a), G (b), Nucleocapsid (N) and Matrix (M2)
Elderly 2.9-fold increase in T cells by ELISPOT (GMT SFU from baseline)

100% (18/18) elderly subjects recorded a boost in T cell responses (doubling of SFU relative to baseline)

No booster effect observed following first vaccination at week 0
BOOSTING ANTIBODIES AGAINST RSV

- Adult elderly 2.3-fold increase in IgG antibody titer by ELISA (geometric mean titer from baseline)
- 89% of elderly subjects had a boost in IgG levels (% of group of with titer > 95th percentile of the placebo group)
• Adult elderly 2.0-fold increase in IgA antibody titers by ELISA (geometric mean titer from baseline)
NEXT STEPS:
PHASE 2 DOSE RANGING IN ELDERLY (≥55 YEARS OLD)

Randomized, blinded, placebo controlled dose ranging study in 480 subjects

<table>
<thead>
<tr>
<th>Groups</th>
<th>N</th>
<th>Vaccine Dose</th>
<th>Schedule (Day)</th>
<th>Route</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>80</td>
<td>Low</td>
<td>0 MVA-BN RSV</td>
<td>Placebo IM</td>
</tr>
<tr>
<td>2</td>
<td>80</td>
<td>Low</td>
<td>0 MVA-BN RSV</td>
<td>MVA-BN RSV IM</td>
</tr>
<tr>
<td>3</td>
<td>80</td>
<td>Medium</td>
<td>0 MVA-BN RSV</td>
<td>Placebo IM</td>
</tr>
<tr>
<td>4</td>
<td>80</td>
<td>Medium</td>
<td>0 MVA-BN RSV</td>
<td>MVA-BN RSV IM</td>
</tr>
<tr>
<td>5</td>
<td>80</td>
<td>High</td>
<td>0 MVA-BN RSV</td>
<td>MVA-BN RSV IM</td>
</tr>
<tr>
<td>6</td>
<td>80</td>
<td>-</td>
<td>28 Placebo</td>
<td>Placebo IM</td>
</tr>
<tr>
<td>Total</td>
<td>480</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Objectives
• Identify optimal dose and schedule

Timelines
• Initiate enrolment Fall 2016
• Topline data available mid-2017
CV-301 CANCER IMMUNOTHERAPY
DESIGNED FOR THE TREATMENT OF MULTIPLE CANCERS

New and improved vaccine construct based on MVA-BN

MVA-BN + CEA + MUC-1 = CV-301

Lung, Breast, Colorectal, Ovarian, Gastric, Bladder, Liver and Renal cancer

Leverage Existing Clinical Data

Preliminary evidence of efficacy generated in multiple clinical studies.

Safety data with over 300 subjects treated.

CV-301 in Combination with Immune Checkpoint Inhibitors

BN sponsored

NCSLC

Bladder
Colorectal

Exploring combinations with PD-1/PD-L1 in company collaborations or with NCI
COMPLETE TUMOR REGRESSION FROM POXVIRUS-BASED IMMUNOTHERAPY COMBINED WITH PD-1 & LAG-3 BLOCKADE

CT26-HER2 solid tumor model:
MVA-BN-HER2 immunotherapy (s.c.) and/or anti-PD1 + anti-LAG3 antibody (i.p.)
Q2wks x2 (d1 and 15)

Durable Response After Mice Were Re-Challenged
# BRACHYURY AS A TARGET FOR CANCER VACCINES

## Cancer types that are Brachyury positive

<table>
<thead>
<tr>
<th>LUNG CANCER</th>
<th>BREAST CANCER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary tumor</td>
<td></td>
</tr>
<tr>
<td>Invasive tumor cells</td>
<td></td>
</tr>
<tr>
<td>Primary tumor</td>
<td></td>
</tr>
<tr>
<td>Bone metastasis</td>
<td></td>
</tr>
</tbody>
</table>

### LUNG CANCER
- Primary tumor
- Invasive tumor cells

### BREAST CANCER
- Primary tumor
- Bone metastasis

## Cancer Types

- Lung
  - NSCLC
  - SCLC
- Breast
  - TNBC
- Prostate
- Colon
- Liver
- Gastric
- Head and neck
- Chordoma
- Embryonal Carcinoma

---

**Migration and Invasion**

<table>
<thead>
<tr>
<th></th>
<th>Migration</th>
<th>Invasion</th>
</tr>
</thead>
<tbody>
<tr>
<td>pcDNA</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>pBrachyury</td>
<td>12</td>
<td>15</td>
</tr>
</tbody>
</table>

* indicates a significant difference.
These findings show for the first time that advanced cancer patients can be safely immunized with an MVA-based vaccine targeting brachyury, and can develop brachyury-specific T-cell immune responses.

MVA-BN BRACHYURY: PHASE 1 DATA

- 38 patients with advanced cancer (N=25) or chordoma (N=13)
  - Advanced cancers included Colorectal, Breast (ER+) NSCLC (EGFR mutated), Prostate, Pancreatic, Ovarian and Cholangiocarcinoma
- Dose escalation, safety and immunogenicity study
  - No SAE’s associated with vaccine
  - At DL2 and DL3, ~80% of the patients that demonstrated brachyury-specific T-cells demonstrated responses in both CD4 and CD8 T-lymphocytes

<table>
<thead>
<tr>
<th>Dose Level</th>
<th>Dose and Schedule</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (N=3)</td>
<td>1 site of injection at 2 x 10^8 IU given every 28 days for 3 doses</td>
</tr>
<tr>
<td>2 (N=17)</td>
<td>2 sites of injection at 2 x 10^8 IU given every 28 days for 3 doses</td>
</tr>
<tr>
<td>3 (N=18)</td>
<td>4 sites of injection at 2 x 10^8 IU given every 28 days for 3 doses</td>
</tr>
</tbody>
</table>

These findings show for the first time that advanced cancer patients can be safely immunized with an MVA-based vaccine targeting brachyury, and can develop brachyury-specific T-cell immune responses.¹

¹Heery, Donahue, et al.
# ANTICIPATED SELECTED MILESTONES
## 2016/2017

<table>
<thead>
<tr>
<th>PROSTVAC: prostate cancer</th>
<th>IMVAMUNE: smallpox vaccine</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Phase 3 top-line data including interim analyses</td>
<td>• Finalize manufacturing activities to support a U.S. EUA for freeze-dried IMVAMUNE</td>
</tr>
<tr>
<td>• Data from NCI-sponsored Phase 2 trials</td>
<td>• Additional Rest of World orders</td>
</tr>
<tr>
<td>• Initiate Phase 2 study in combination with ipilimumab in collaboration with BMS</td>
<td>• Complete enrolment of Phase 3 non-inferiority study</td>
</tr>
<tr>
<td>• Initiate NCI-sponsored Phase 2 study in combination with ipilimumab and nivolumab</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Janssen: partnership</th>
<th>Pipeline: projects</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Complete Phase 2 and Phase 3 studies of the Ebola prime-boost vaccine regimen</td>
<td>• MVA-BN RSV Phase 1 data</td>
</tr>
<tr>
<td>• Initiate HPV Phase 1 study in cervical cancer</td>
<td>• MVA-BN RSV Phase 2 dosing study initiation + read out</td>
</tr>
<tr>
<td>• Potential expanded collaboration with Janssen on two additional infectious disease targets</td>
<td>• MVA-BN RSV Phase 2 field efficacy initiation</td>
</tr>
<tr>
<td></td>
<td>• MVA-BN RSV Phase 1 pediatric study initiation</td>
</tr>
<tr>
<td></td>
<td>• MVA-BN Brachyury Phase 2 initiation</td>
</tr>
<tr>
<td></td>
<td>• CV-301 + nivo Phase 2 initiation in lung cancer</td>
</tr>
<tr>
<td></td>
<td>• CV-301 + checkpoint inhibitor Phase 2 initiation in two additional indications</td>
</tr>
</tbody>
</table>