Clinical-Stage Cell Therapy Programs Addressing Significant Unmet Medical Needs in Neurology and Oncology

Asterias Biotherapeutics

NYSE Market: AST

January 2017

Forward-Looking Statements

Statements pertaining to future financial and/or operating results, future growth in research, technology, clinical development, and potential opportunities for Asterias, along with other statements about the future expectations, beliefs, goals, plans, or prospects expressed by management constitute forward-looking statements. Any statements that are not historical fact (including, but not limited to statements that contain words such as “will,” “believes,” “plans,” “anticipates,” “expects,” “estimates”) should also be considered to be forward-looking statements. Forward-looking statements involve risks and uncertainties, including, without limitation, risks inherent in the development and/or commercialization of potential products, uncertainty in the results of clinical trials or regulatory approvals, need and ability to obtain future capital, and maintenance of intellectual property rights. Actual results may differ materially from the results anticipated in these forward-looking statements and as such should be evaluated together with the many uncertainties that affect the businesses of Asterias, particularly those mentioned in the cautionary statements found in Asterias’ Registration Statement on Form S-3 and Prospectus, as well as its other periodic reports, filed with the Securities and Exchange Commission. Asterias disclaims any intent or obligation to update these forward-looking statements.

Asterias has filed with the Securities and Exchange Commission ("SEC") a registration statement (including a prospectus) and has filed or will file with the SEC a prospectus supplement to the prospectus for the offering to which this presentation relates. Before you invest, you should read the prospectus supplement and the accompanying prospectus in that registration statement and the documents incorporated by reference or filed as exhibits to the registration statement for more complete information about Asterias and this offering. You may get these documents and other documents for free by visiting EDGAR on the SEC web site www.sec.gov.

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Strong Leadership Team with Proven Track Record

Name	Experience
Steve Cartt President and CEO	• Former COO of Questcor Pharmaceuticals – Led Questcor's 2007-2014 commercial strategy, turnaround and multiple expansions – Grew company revenue from $10 million to $1 billion – Over 30 years of experience in pharma and biotech; at Questcor, Elan, ALZA
Don Bailey Chairman of the Board	• Former CEO of Questcor Pharmaceuticals, led Questcor's corporate turnaround
Jane Lebkowski, Ph.D. CSO	• Former CSO of Geron • Over 30 years experience in R&D of cell and gene therapies at Geron, Applied Immune Sciences, and Rhône Poulenc Rorer
Katy Spink, Ph.D. COO	• Former SVP, Cell Therapy Program Operations at Geron • Prior to Geron, Dr. Spink was a management consultant at McKinsey
Ed Wirth, M.D., Ph.D. CMO	• Former CSO of InVivo Therapeutics • 25 years experience translational research at the University of Chicago, Geron and InVivo
Ryan Chavez CFO, EVP Finance & GC	• Former General Counsel for Mallinckrodt ARD division • Associate General Counsel at Questcor; financial positions at GE

During Mr. Cartt's and Mr. Bailey's seven year tenure, Questor's stock price went from $0.35/share in August 2007 to the acquisition price of $93.58/share in 2014

During this period, Questcor's valuation increased over 200x, from $25 million to the company's acquisition by Mallinckrodt for $5.8 billion

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Development Pipeline

PROGRAM	PRECLIN	PHASE 1	PHASE 2	PHASE 3	STATUS
AST-OPC1* Spinal Cord Injury (subacute)	*Phase 1/2a in progress; positive early efficacy data presented 9/2016*				*Ph 1/2a ongoing* CIRM CALIFORNIA INSTITUTE FOR REGENERATIVE MEDICINE
AST-VAC1** Leukemia (AML) Autologous	*Process development in progress Phase 2b to start early 2018*				*Process development & enhancement in progress*
AST-VAC2** Lung Cancer Allogeneic	*Phase 1/2a first patients enrolled Q2 2017*				*Ph 1/2a 1st patients enrolled Q2 2017* CANCER RESEARCH UK

* *Potential for application in advanced MS, stroke*

** *Potential in multiple cancer types/stages as well as combination therapy*

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Key Highlights

- AST-OPC1 (Pluripotent stem cell platform)
  - Ongoing Phase 1/2a trial in spinal cord injury (SCI); supported by $14.3m grant from CIRM
  - Positive safety profile to-date in two safety cohorts (thoracic SCI trial and cervical SCI trial)
  - All subjects in Cohorts 1 & 2 have exhibited both improved upper extremity motor scores (UEMS) and improved motor levels relative to baseline
  - Cohort 2 (10 million cells) has shown meaningfully greater UEMS improvement at 3, 6 and 9 months of follow up than matched controls
  - AIS-A 20 million cell cohort and 10 million cell AIS-B cohort already have two patients each dosed
- AST-VAC1 (Cancer Immunotherapy platform – autologous)
  - Positive efficacy signal from open label Phase 2 study in AML (maintenance of remission)
  - Planning confirmatory randomized/controlled phase 2b to initiate 2018
  - Critical path: process development effort underway; completion expected Q3 2017
- AST-VAC2 (Cancer immunotherapy platform – allogeneic)
  - Phase 1/2a trial in non-small cell lung cancer (NSCLC) enrollment of first patients Q2 2017
  - Trial fully funded by Cancer Research UK

- ✓ Pluripotent stem cell platform
- ✓ Significant grant funding from California Institute of Regenerative Medicine (CIRM)
- ✓ Phase 1/2a clinical trial in spinal cord injury in progress

AST-OPC1

Video

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Spinal Cord Injury: High Unmet Medical Need, Substantial Commercial Opportunity

- Spinal cord injury (SCI) affects 17,000 patients per year in U.S.[(1)]
  - Primarily affects young/healthy males in their 20s and 30s at time of injury
  - Can be devastating to quality of life and ability to engage in activities of daily living
  - No currently approved therapies
- Lifetime direct healthcare costs for a 25 year old patient can reach $5 million[(1)]
- Very high unemployment rate; 63% of cervical injury patients are unemployed even 8 years post-injury
- Significant commercial opportunity exists in helping restore hand/arm/finger motor function, increasing independence and lessening daily healthcare burden[(2)]

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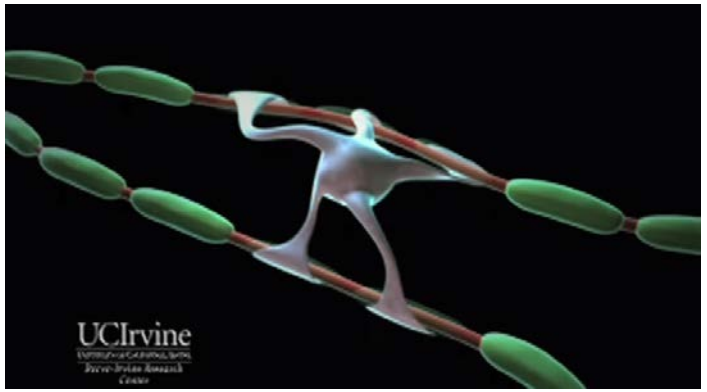
(1) National Spinal Cord Injury Statistical Center, Facts and Figures 2016
(2) Internal estimates

AST-OPC1 Designed to Address the Complex Pathology of SCI

- AST-OPC1 is a cellular therapy utilizing oligodendrocyte progenitor cells (OPCs)
- AST-OPC1 is made from a well-established, pluripotent embryonic stem cell line originally created in the 1990s; can serve entire OPC1 product lifecycle
- Importantly, no fetal tissue or adult cells are used
- OPCs support and myelinate neurons, and can be damaged and lost in cases of SCI
- Replacement of lost OPCs results in:
  - Remyelination of axons
  - Prevention of cavitation
  - Secretion of neurotrophic factors
  - Improved motor function



NOTE: AST-OPC1 may also be potentially applied to other neurodegenerative disorders (e.g. MS, stroke)

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AST-OPC1 Supported by Extensive Pre-Clinical Evaluation

AST-OPC1 has been evaluated in 28 animal studies (*3000+ rodents and pigs)*

Activity

- Induces persistent myelination
- Secretes neurotrophic factors
- Induces vascularization
- Reduces parenchymal cavitation

Efficacy

- Improves motor function in models of thoracic and cervical SCI

Biodistribution

- Migrates up 5cm in spinal cord
- No distribution outside central nervous system

Toxicity

- Does not increase mortality
- Does not induce allodynia
- Does not induce systemic toxicity

Tumorigenicity

- Does not produce teratomas

Dosing / Delivery

- Active doses established

Immune Rejection

- Not highly susceptible to direct immune responses

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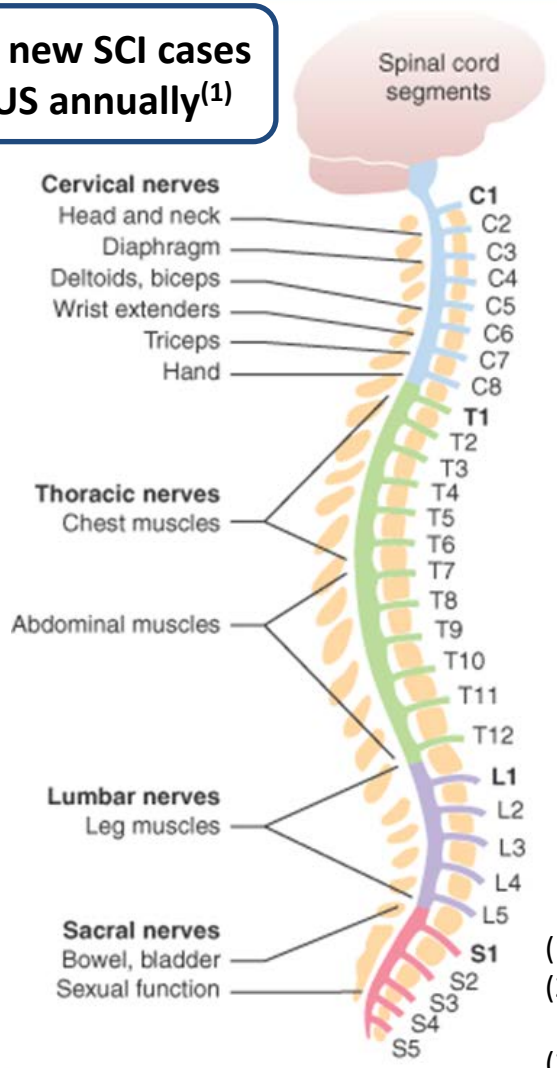
AST-OPC1: >4,000 patients addressable with target initial SCI label, plus 5,000 additional patients through SCI label expansion

17,000 new SCI cases in the US annually(1)



	Target patient estimates(2)	Potential market(3)
	>4,000 under first label C4-C7 ASIA A/B/C	>$1B
	5,000 additional patients in remaining cervical and thoracic injuries	>$1B
		>$2B

(1) 2016 NSCIC SCI Facts and Figures at a Glance
(2) Estimates by indication calculated based on 2014 NSCIC survey data, adjusted to exclude penetrating and secondary medical injuries
(3) Based on typical pricing for new therapeutics addressing devastating orphan diseases/disorders

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AST-OPC1 ***SCiSTAR*** Trial in Complete Cervical Spinal Cord Injury (SCI)

Study Design

- Phase 1/2a trial in progress (up to N=35)
- 8-10 clinical sites
- AIS-A and AIS-B patients
- 2m, 10m, and 20m cell cohorts
- Primary Assessment: Safety
- Secondary Assessment: ISNCSCI exam
  - Motor function assessment

Study Goals

- Assess safety and efficacy
- Evaluate potential dose response
- Determine target patient population and optimal design for registration trial

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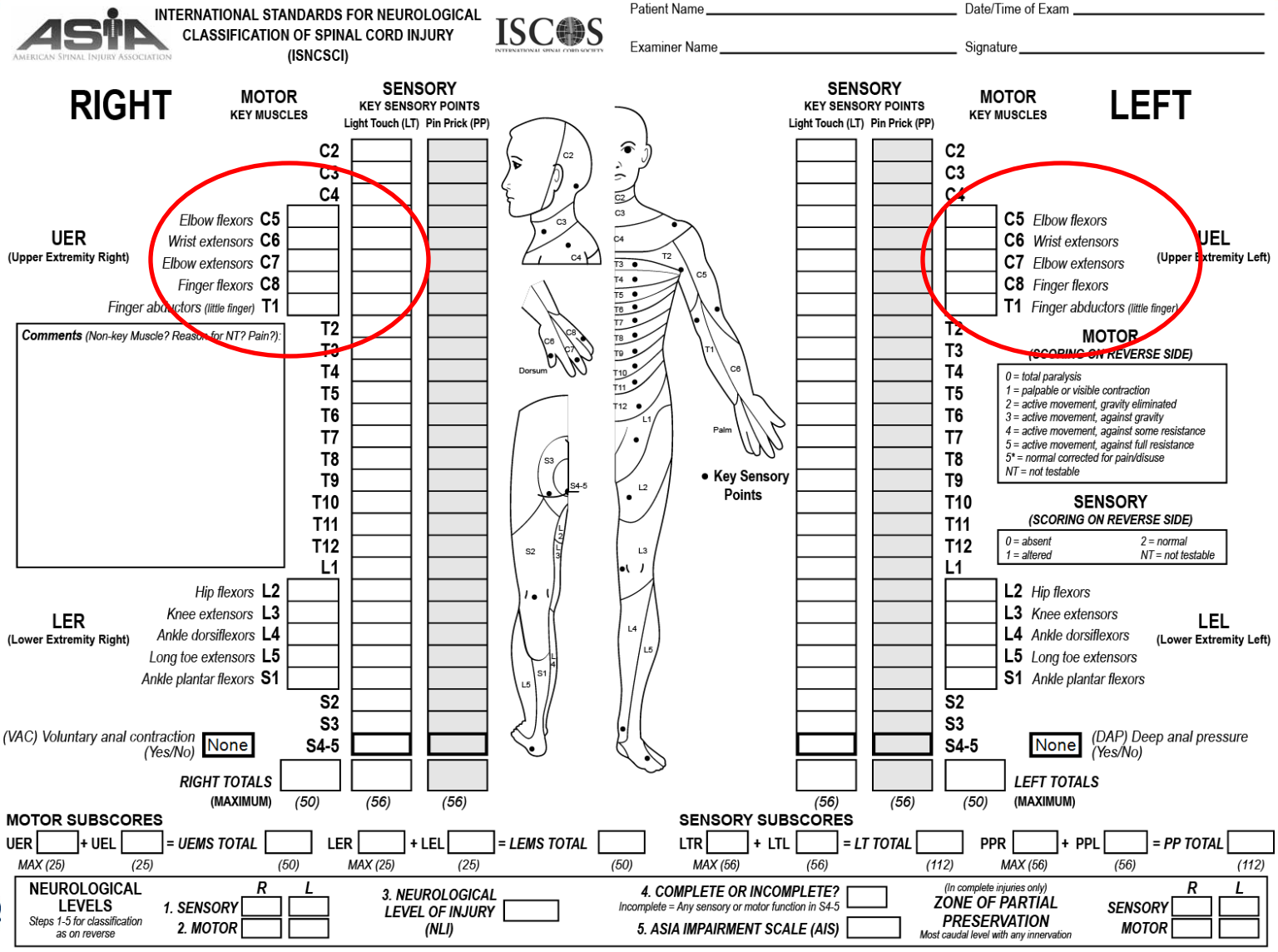
ISNCSCI Exam

ISCoS ISNCSCI Algorithm



AST-OPC1 Therapy is Designed to Increase Patient Motor Function and Improve Quality of Life & Ability to Live Independently

- Motor level improvements translate into clinically significant improvements in ability to self-care and significant reductions in cost of care

	Capability				
	C1-C3	C4	C5	C6	C7-C8
Bowel					
Bladder					
Bed Mobility					
Transfers					
Pressure Relief					
Eating					
Dressing					
Grooming					
Bathing					
Wheelchair					
Car Transport					
Daily Home Care	**24 hr Attendant**	**18-24 hr Attendant**	**6-12 hr Assistance**	**4 hr Housework**	**1 hr Housework**

Total Assist

Partial Assist

Independent

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Steeves et al., Top Spinal Cord Inj Rehabil 2012; 18(1): 1-14

Enrollment Progress/Anticipated Completion

Dosing complete
Currently enrolling
Future enrollment

AIS-A Cohorts

Cohort 1 – 2 million
3 subjects

- Enrollment completed in August 2015

Cohort 2 – 10 million
6 subjects

- Enrollment of 5th Subject completed in July 2016
- 6th subject dosed
- Five subjects have completed the 6 month visit & three of these subjects have also completed the 9 month visit

Cohort 3 – 20 million
5-8 subjects

- First two subjects dosed
- Enrollment expected to be completed late Q1 2017
- 6 month data expected late Q3 2017

AIS-B Cohorts

Cohort 4 – 10 million
5-8 subjects

- First two subjects dosed
- Enrollment expected to be completed late Q1 2017
- 6 month data expected late Q3 2017

Cohort 5 – 20 million
5-8 subjects

- Enrollment expected to be completed in Q3 2017
- 6 month data expected in Q1 2018

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Motor Recovery of Subjects Receiving AST-OPC1 Compared to That of Closely Matched Historical Controls

Matched controls

- Subset of SCI patients in the **EMSCI database*** identified meeting matching criteria
- Time frames matched to baseline assessments of those in the SCiStar trial

* **EMSCI** (www.emsci.org) is the most complete and most current SCI database available for comparison (> 3300 patients, ~300 new patients added annually)
  - Actively managed database
  - Best available ISNCSCI dataset

Matching criteria

- Traumatic injury
- Baseline assessment between 16-40 days from injury
- AIS A at baseline
- Age 18-69
- NLI of C5-C7 at baseline
- UEMS at baseline 7-32

Baseline includes 73 matched patients across multiple time points

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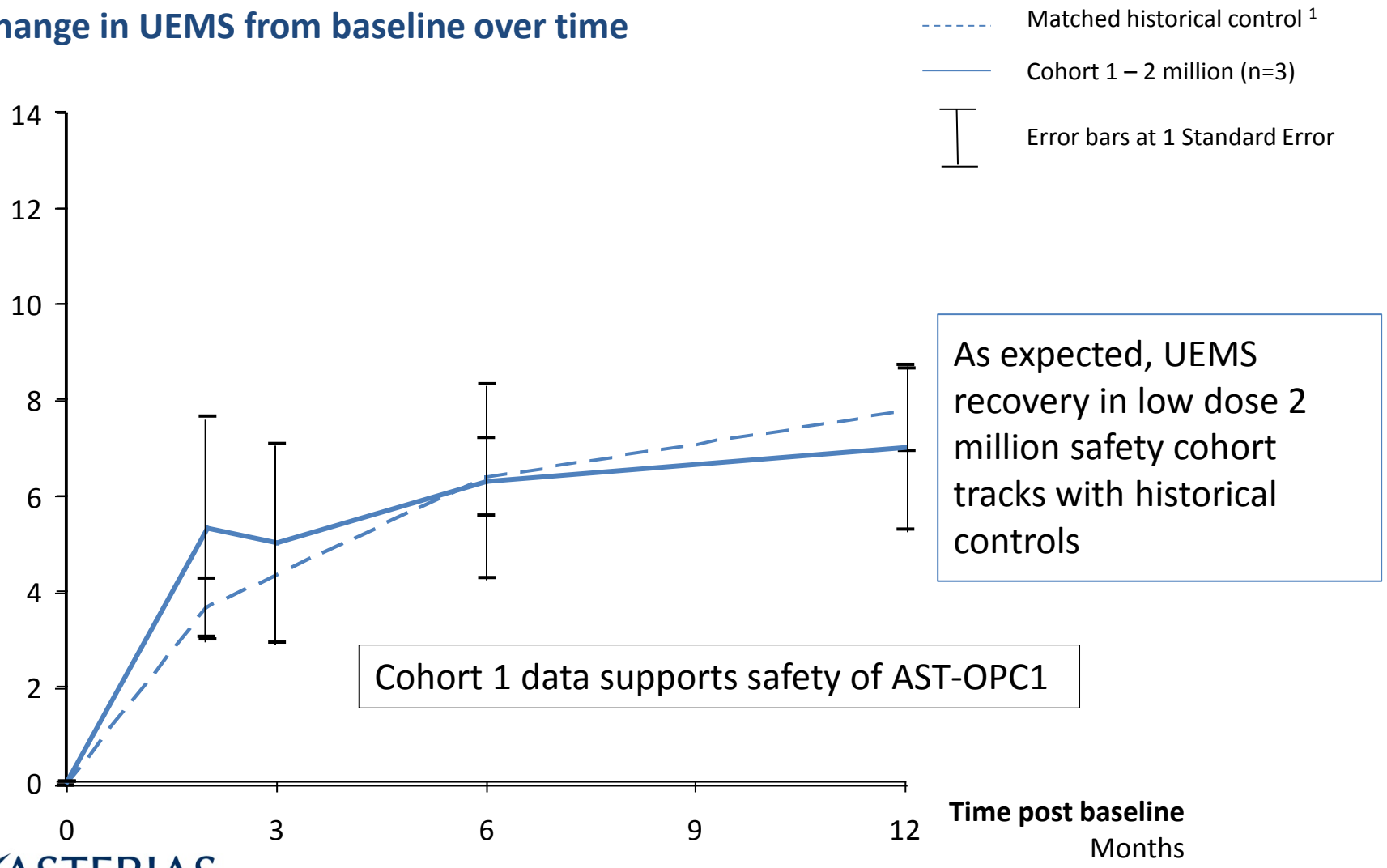
Low Dose 2 Million Cell Cohort Has Motor Recovery Similar to Matched Historical Controls

Change in UEMS from baseline over time



As expected, UEMS recovery in low dose 2 million safety cohort tracks with historical controls

Cohort 1 data supports safety of AST-OPC1

1 n=73 at baseline, n=68 at 2 months, n=62 at 6 and 12 months

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Subjects Receiving 10 million AST-OPC1 Have Improved Motor Function as Measured by UEMS

AIS-A 10 million cell cohort data

	3 month	6 month	9 month
# patients	6	5	3
Average	8.2	9.8	13
Median	6.5	9	13
High	14	16	18
Low	5	6	8

- All subjects in Cohort 2 have exhibited improved upper extremity motor scores (UEMS) through last follow-up
- Maintained or continued improvement observed through 6 and 9 months post-treatment

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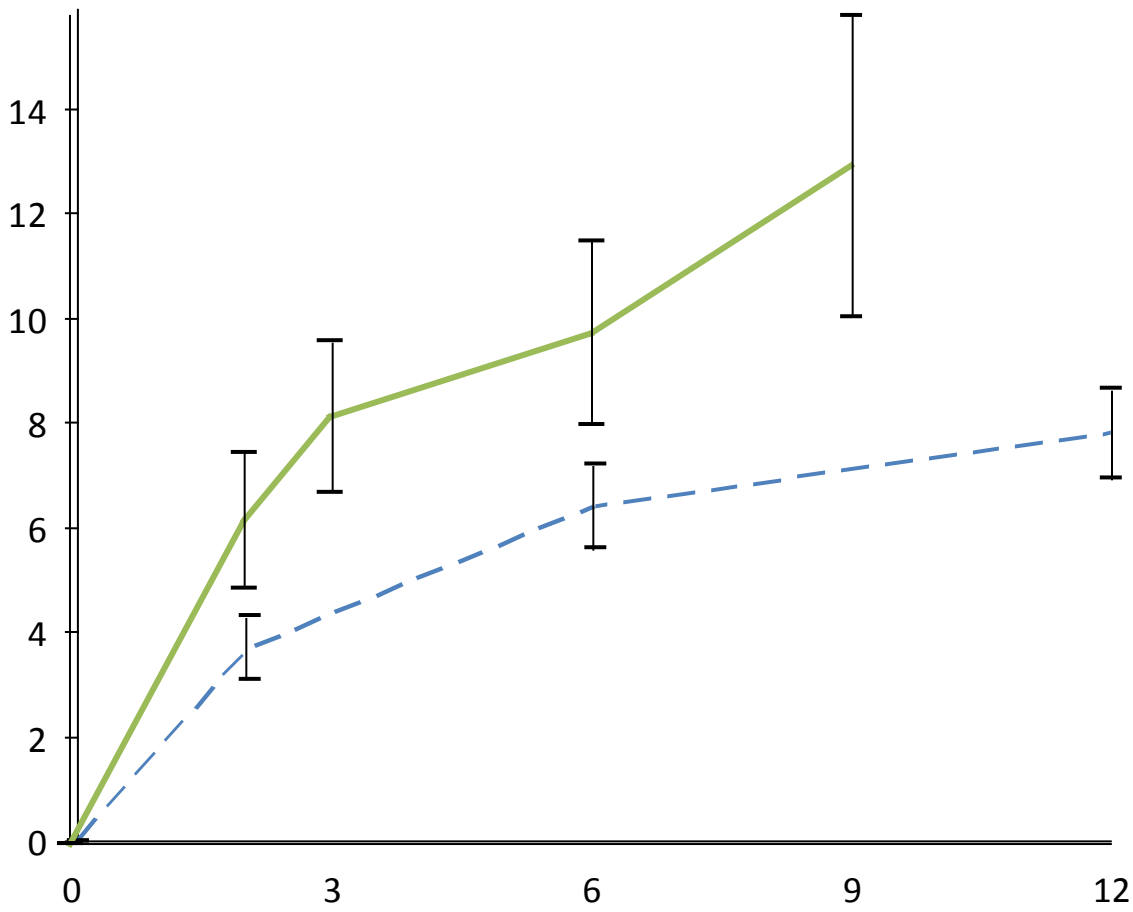
AIS-A 10 Million Cell Cohort Experienced Greater UEMS Recovery than Matched Historical Control Group

Change in UEMS from baseline over time



10 million cell dose cohort shows meaningful improvement by 3 months and it continues to increase through 9 months

1 n=5 at 6 months; n=3 at 9 months

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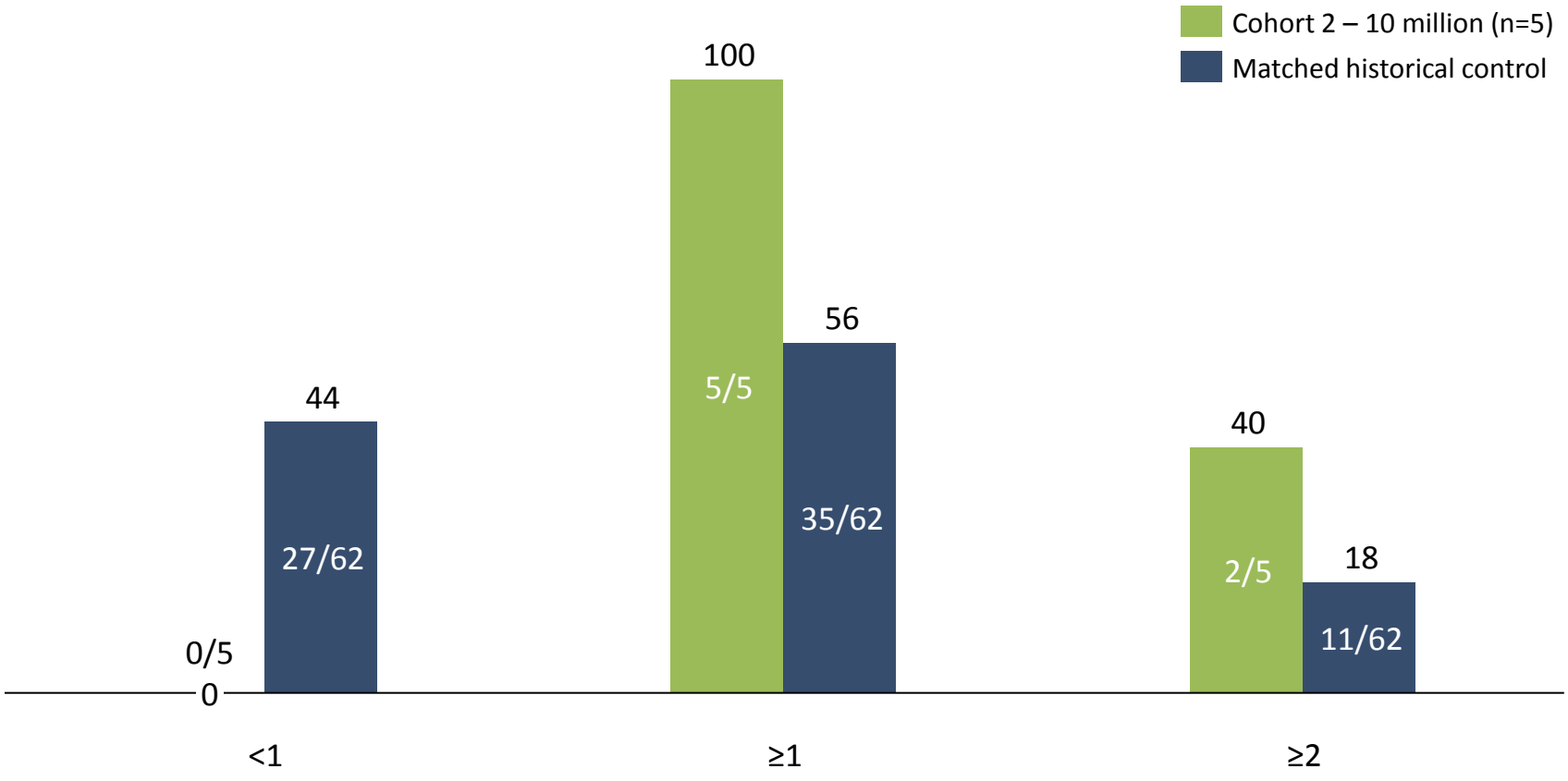
AIS-A 10 Million Cell Cohort Shows Improved Motor Level Recovery vs. Matched Historical Controls

Cohort 2 (10 million cells) motor level recovery vs. matched historical controls

Percentage of patients by recovery level as of last visit (6 or 9 months)



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Safety Profile Remains Positive

- Safety profile from all AST-OPC1 patients enrolled to date remains positive through 6-12 months of follow up
- Safety of the injection procedure has been excellent
- Immunosuppression with tacrolimus has been well tolerated
- Safety profile of AST-OPC1 cells has been favorable, including no SAEs related to AST-OPC1 and no adverse findings on MRI scans to date

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Summary of Results To Date

- All subjects in Cohorts 1 & 2 have exhibited both improved upper extremity motor scores (UEMS) and improved motor levels relative to baseline
- Early improvements in motor function reported for Cohort 2 (10 million cells) in September 2016 have been maintained or further increased through last date of follow up
- UEMS improvement in Cohort 1 (2 million cells) was similar to matched controls which is indicative of safety in this low dose safety cohort
- Cohort 2 (10 million cells) has shown meaningfully greater UEMS improvement through 6- to 9-months of follow up, suggestive of a dose-dependent therapeutic effect
- Subjects in Cohort 2 have also shown a greater degree of motor level recovery than matched controls

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Projected AST-OPC1 Data Milestones

Next Data Readout

Milestone	Est. Date
12 month data from AIS-A Cohort 2 (10M cells)	July 2017
6 month data from AIS-B Cohort 1 (10M cells)	Q3 2017
6 month data from AIS-A Cohort 3 (20M cells)	Q4 2017
12 month data from AIS-B Cohort 1 (10M cells)	Q1 2018
6 month data from AIS-B Cohort 2 (20M cells)	Q1 2018
12 month data from AIS-A Cohort 3 (20M cells)	Q2 2018
12 month data from AIS-B Cohort 2 (20M cells)	Q3 2018
Final top-line efficacy data, all cohorts	Q3 2018

Q2/Q3 2017
Engage in discussions with FDA on clinical development plan, potential accelerated development pathway for AST-OPC1, and possible "breakthrough" designation

Q3 2017
Gain FDA agreement on plan for randomized, controlled trial of AST-OPC1 projected to begin in early 2018

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- ✓ Patient-specific (autologous)
- ✓ Acute Myelogenous Leukemia (AML)
- ✓ Process development/enhancement in progress

AST-VAC1

AST-VAC1 Targets AML Need in Older and High-Risk Patients

- AST-VAC1 is being developed as a treatment for ***maintenance of remission*** in AML patients >60 years and in high-risk patients (not eligible for bone marrow transplant)
- ~19,000 new AML cases diagnosed and ~10,500 deaths from AML in U.S. annually(1)
- AML patients >60 years old do not tolerate AML therapies well
  - Average age of an AML patient is 67

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(1) 2014 estimate

AST-VAC1 Has Potential to Safely Maintain AML Remission

AML Two-Step Treatment Paradigm: *Induction* and *Maintenance* of Remission

Step 1: Induction

- Traditional approach: chemotherapy to get patients into complete remission
- Most new AML therapies also target ***Induction of Remission***

Step 2: Consolidation/Maintenance

- Chemotherapy and/or HCT to try to maintain remission long term
- Current treatments poorly tolerated by patients >60 years old

AST-VAC1 is one of few new therapies targeting *Maintenance of Remission*

- ✓ *Potential alternative to consolidation chemotherapy*
- ✓ *Likely better safety and tolerability than chemotherapy or HCT*

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Positive Signal in Open-Label Phase 2 Trial

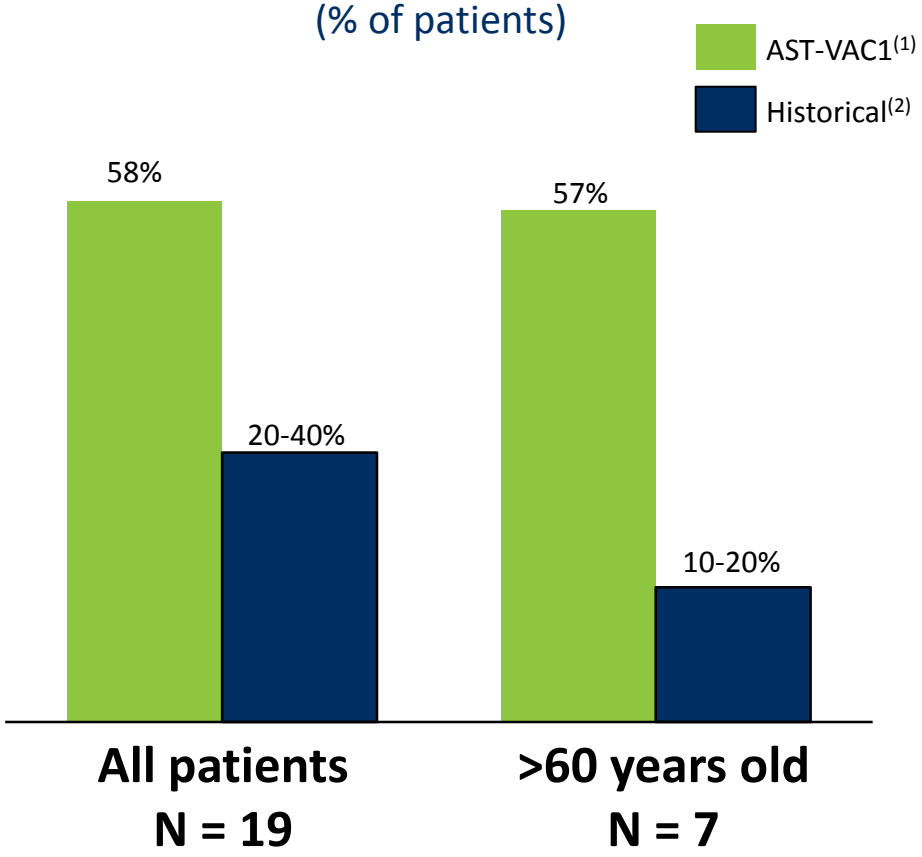
Greatly extended relapse-free survival in AML patients, even those with high-risk AML

Phase 2 Trial Highlights

- Multicenter, open-label trial
- All patients had already achieved complete remission (CR)
- Treated 19 patients with AML in complete remission (CR)
  - Included only intermediate and high risk patients, evaluated by cytogenetics
  - N=7 in very high risk >60 year age group
- 1 SAE occurred (ITP), possibly related to treatment(3)

Relapse Free Survival at 52 Months

(% of patients)



(1) VAC1 Phase 2 results, presented at ASCO, May 2015; manuscript submitted
(2) Mayer NEJM 1994; Rollig, J Clin Onc 2011
(3) ITP is commonly observed in AML patients and may not be linked to treatment with AST-VAC1 or any other therapies.

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Path Forward for AST-VAC1 Development

- Critical path: process development; ongoing, projected completion Q3 2017
  - reduce cycle time, COGS
- Positive meeting with FDA based on open-label phase 2 efficacy signal and favorable safety profile
  - FDA would support relapse-free survival as surrogate endpoint for accelerated approval; overall survival data would be required for full approval
- Confirmatory randomized/controlled Phase 2b in 2018
  - Phase 2b will inform pivotal phase 3 trial design, significantly de-risk program, enhance potential for non-dilutive funding and greatly strengthen position for partnering

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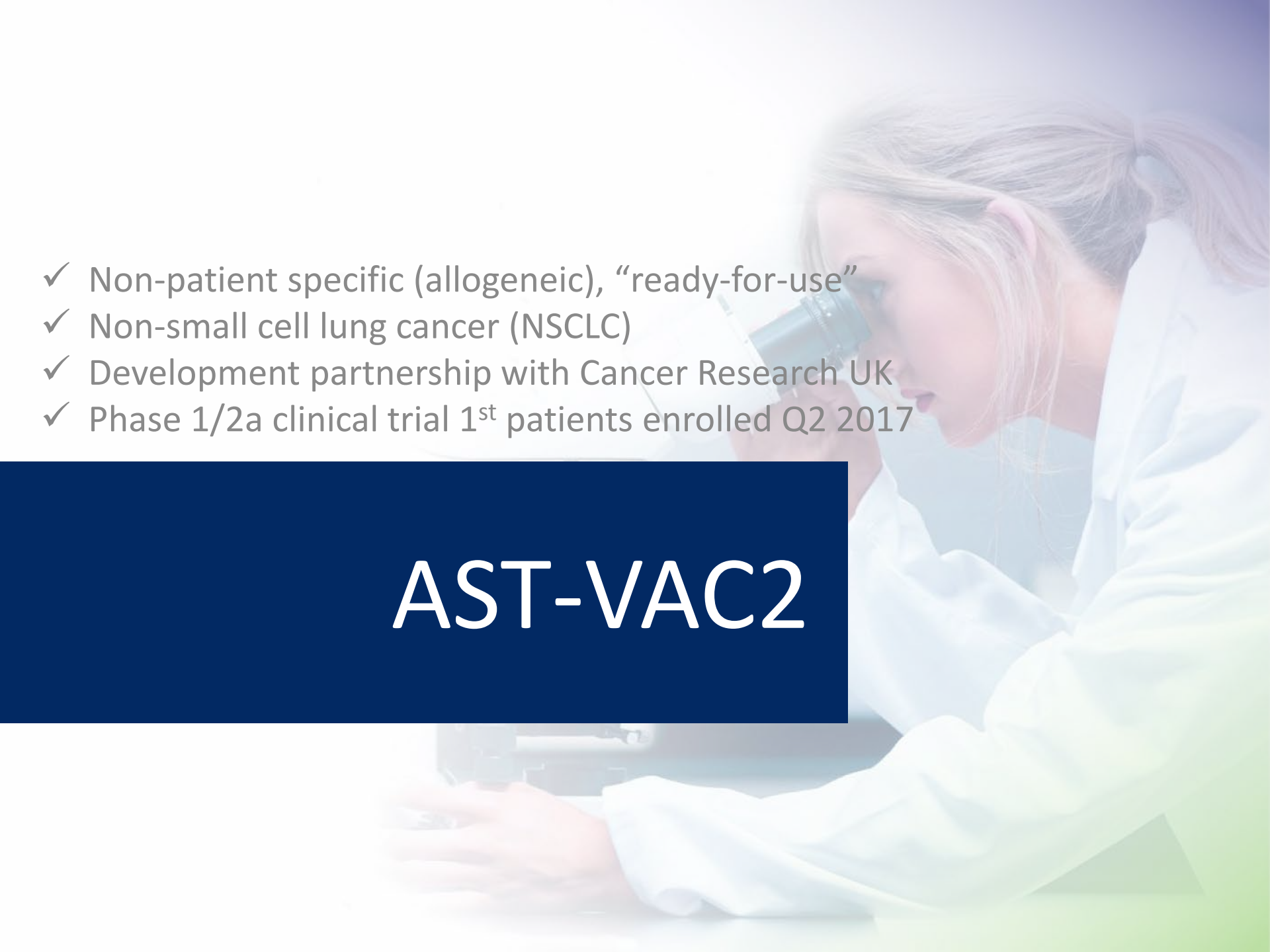

- ✓ Non-patient specific (allogeneic), “ready-for-use”
- ✓ Non-small cell lung cancer (NSCLC)
- ✓ Development partnership with Cancer Research UK
- ✓ Phase 1/2a clinical trial 1st patients enrolled Q2 2017

AST-VAC2

AST-VAC2 Targets an Unmet Need in NSCLC, a Very Large Population of Cancer Patients with High Mortality Rate

- Lung cancer is the most common type of cancer[(1)]
  - Estimated 1.8M new cases and 1.6M lung cancer deaths worldwide in 2012
  - ~220,000 new cases and ~160,000 deaths annually in the U.S.
  - 80% of cases are non-small cell lung cancer (NSCLC)
- NSCLC has the highest death rate of any cancer[(2)]
  - Overall 5-year survival rate for NSCLC is only 18%
- AST-VAC2 may also have applicability in other cancers (e.g. bladder, renal cell, melanoma), since telomerase expression is present in many cancer types
- AST-VAC2 also has potential for use in combination with immune checkpoint inhibitors

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(1) American Lung Association
(2) NCI SEER Cancer Statistics Review

AST-VAC2 is Allogeneic, 'Ready for Use,' Non-Patient Specific

- AST-VAC2 cells are mature allogeneic dendritic cells that have been transfected with hTERT and LAMP(4,5)
  - Not patient-specific: no need to produce individualized vaccines for each patient
  - Manufactured from Asterias embryonic stem cells, does not require patient's own monocytes
  - AST-VAC2 is ready to use on demand, greatly shortening the time to initiate treatment
- Product to be supplied from a single master cell bank, allowing scalability/consistency
- Thousands of patient treatments can be manufactured in a single batch

Centralized Production Facility → **Distributed Frozen Inventory** → **Point of Care**

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Phase 1/2a Trial to be Funded Through CRUK Partnership

- Anticipate MHRA clearance for Phase 1/2a NSCLC trial Q1 2017
- First patients expected to be enrolled Q2 2017
- Partnership with Cancer Research UK (CRUK) funds full cost of GMP manufacturing, regulatory filing, and Phase 1/2a trial
  - CRUK partnership saves Asterias an estimated ~$30M
  - Following a successful Phase 1/2a trial, Asterias can continue development in exchange for modest milestones and royalties to CRUK

CANCER RESEARCH UK

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Asterias Biotherapeutics

- **AST-OPC1 (Pluripotent stem cell platform)**
  - Ongoing SCiSTAR Phase 1/2a trial in spinal cord injury (SCI)
  - Positive initial efficacy readout announced Sept 2016
  - Possible dose-response is emerging by Day 90
  - AIS-A 20 million cell cohort and 10 million cell AIS-B cohort already have two patients each dosed
  - Recent acceleration in enrollment has taken place
- **AST-VAC1 (Cancer Immunotherapy platform – autologous)**
  - Ongoing process development effort with completion expected Q3 2017 (critical path item needed to proceed to Phase 2b)
- **AST-VAC2 (Cancer immunotherapy platform – allogeneic)**
  - Phase 1/2a trial in non-small cell lung cancer (NSCLC) planned, with first patients enrolled Q2 2017